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Fig. 3.—Grotesque Animal Interlacement: "Book of Kells."

Fig. 2.—Border from St. Dympna's Crosier.

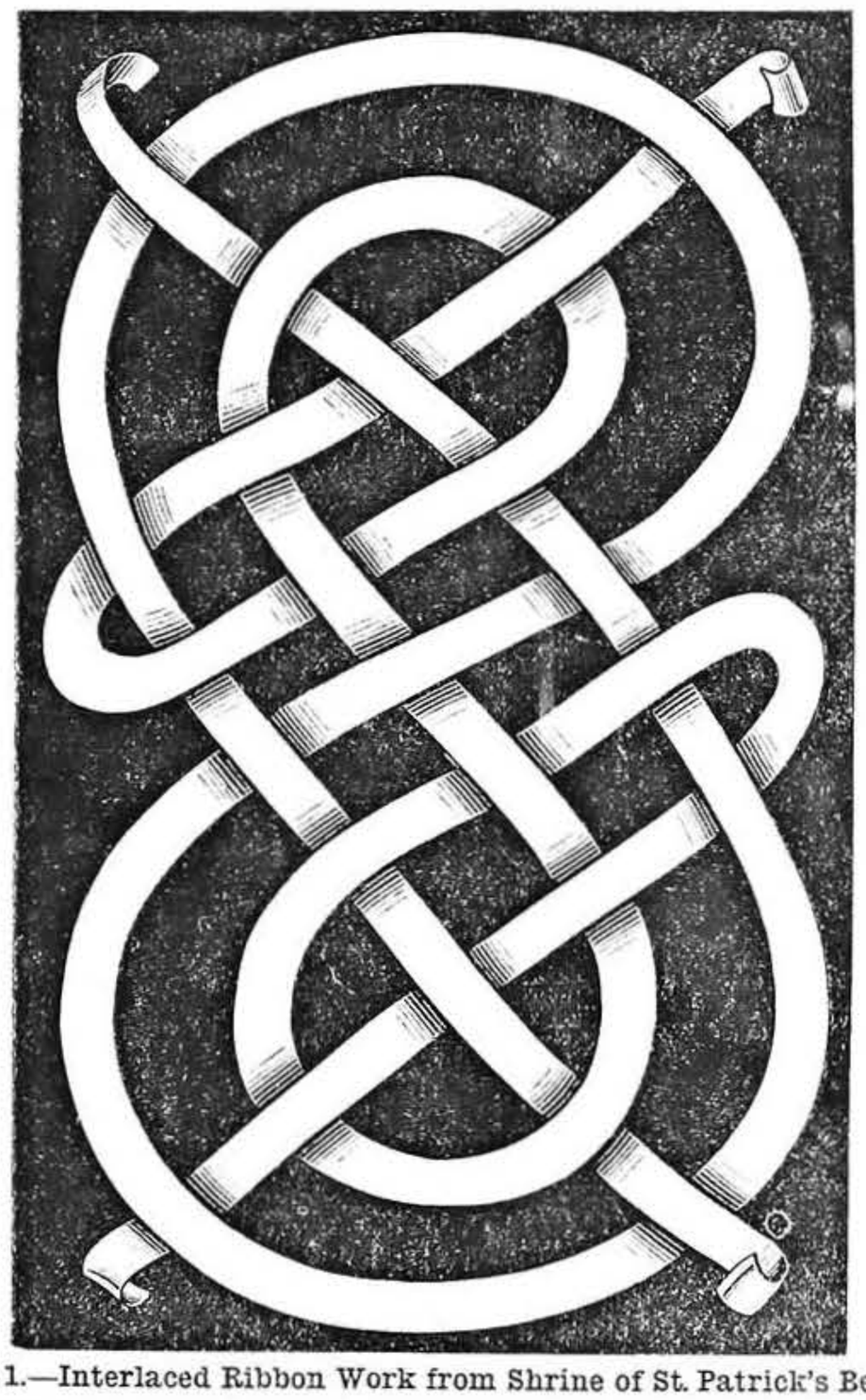

Fig. 1.—Interlaced Ribbon Work from Shrine of St. Patrick's Bell.

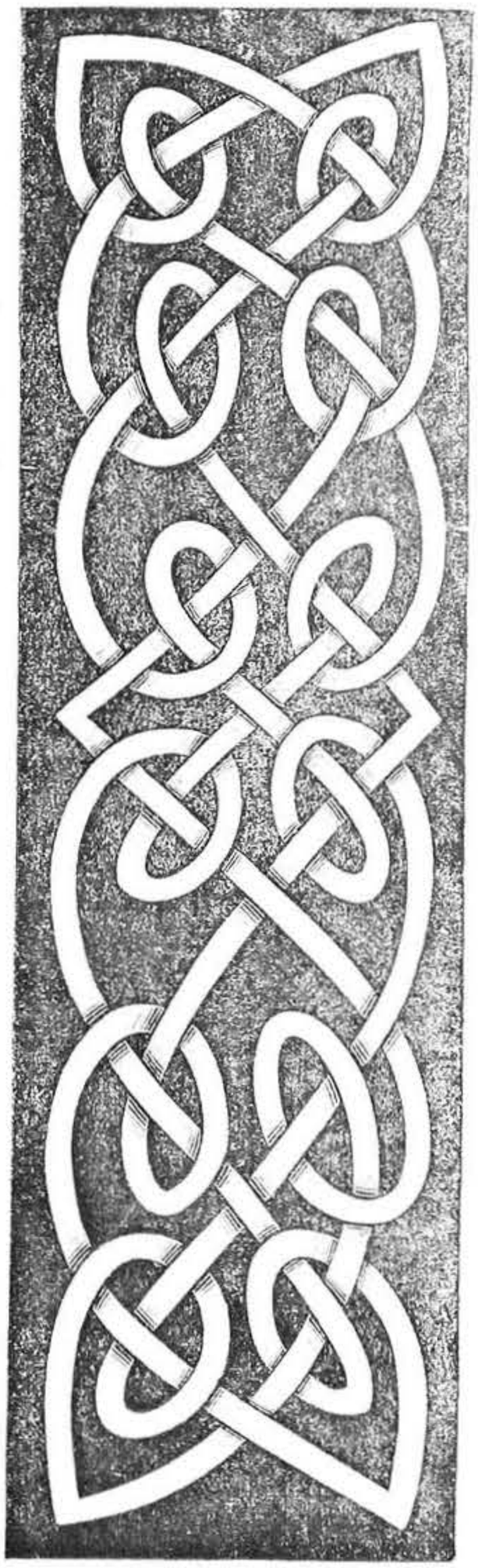

Fig. 5.—Interlaced Ribbon: Ardagh Chalice.

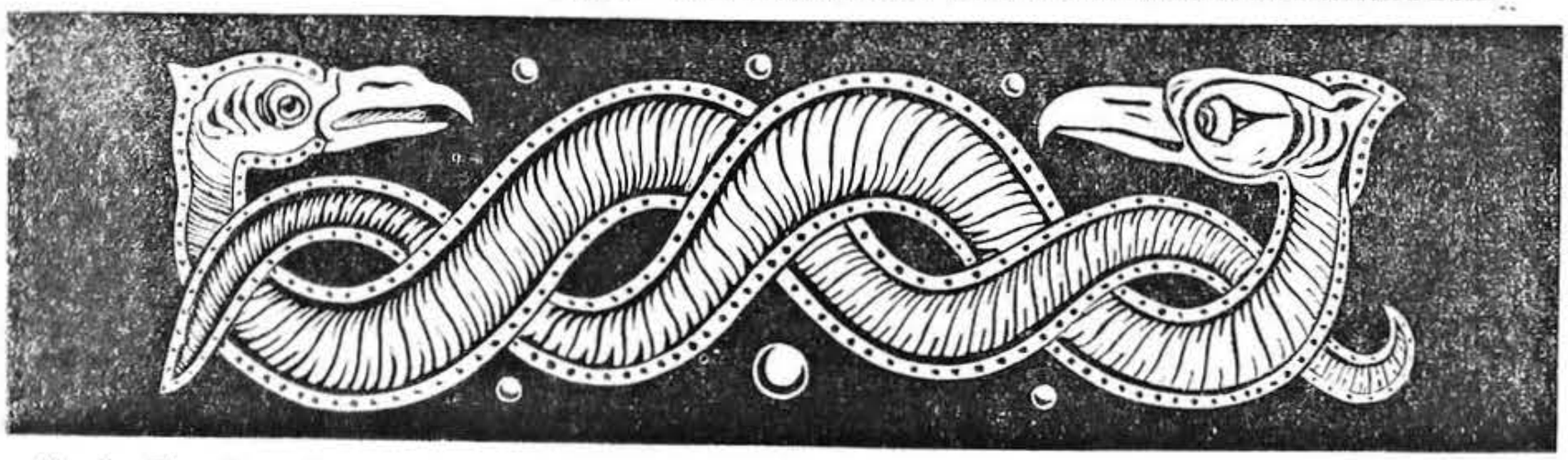

Fig. 4.—Tara Brooch.

SIMPLE EXAMPLES OF KELTIC ORNAMENT.

Drawn by Opifex.

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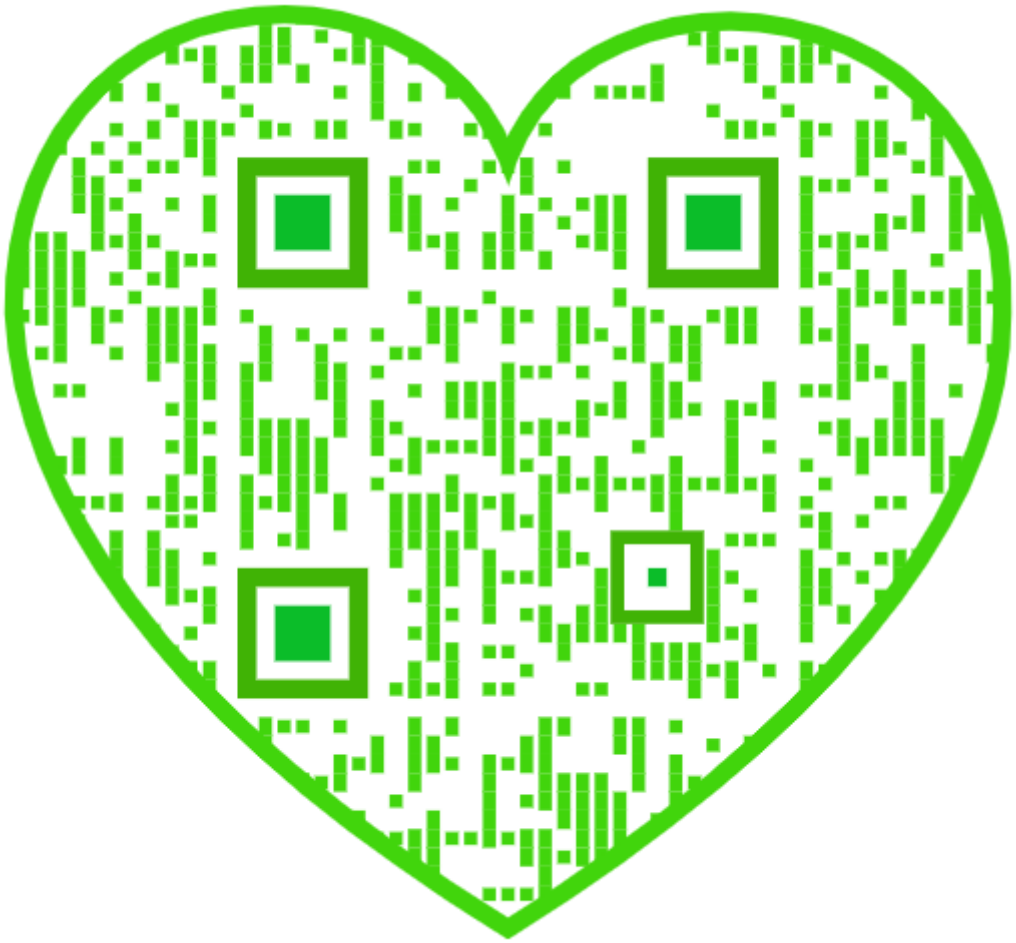

SIMPLE EXAMPLES OF KELTIC ORNAMENTS.

BY OPIFEX.

In mediæval times Irishmen were wonderfully skilled in the art of decoration, especially in the illuminating of manuscripts. They were also very "cunning workmen" in bronze, silver, and gold, and must have been far superior to their posterity of to-day in powers of eyesight and, I think, also in patience.

In intricacy of design, accuracy in detail, and faithfulness in workmanship, the specimens of Keltic or Irish art which survive surpass anything produced by others in any country or period, ancient or modern.

To one who has never before seen any of these original works, a first inspection is simply amazing—assuming, of course, that they possess an appreciative sense. A page of the "Book of Kells" (seventh century), for instance, affords an opportunity for days of patient scrutiny, if one desires to follow the labyrinthine workings of the scrolls, knots, etc., executed by hands which have been at rest for a thousand years.

The chief characteristic of the Keltic style is interlacement, whether of simple "ribbons" (Figs. 1 and 5), grotesque animals (Fig. 3), or plant forms—the last being rare—or combinations of these.

One example will serve to give the reader some idea of the intricate nature of the designs. On a page of the "Book of Armagh" (A.D. 805, cir.) may be seen spaces of less than three-quarters of an inch long, by about half an inch wide, upon which designs are drawn containing 160 interlacements, of a fine ribbon pattern, and the most patient and searching examination with the aid of a powerful magnifying glass will fail to detect a single mistake or irregularity in the interlacing.

It has often struck me that, by means of enlargement and slight modification, some of these patterns might be turned to good account for various purposes of decoration, or be found most useful for fretwork, leather work, wood carving, repoussé work, or, in fact, any work of an artistic kind; and I have lately taken some note sketches from ancient specimens of pure Keltic work, and having found them most suitable and effective for some of the purposes just mentioned, I here give a few of the simpler examples, and hope, with the Editor's approval, to contribute some of a more elaborate nature at a future date.

The centre panel (Fig. 1) is a very simple example of ancient interlaced "ribbon," or strap-work, and is taken from the "shrine" of the bell of St. Patrick—a beautiful specimen of pure Keltic workmanship, made by an old Irish goldsmith, named "Cudulig O'Inmainin, and his sons," about the year 1091, A.D. The body of the shrine is of brass, on which are riveted silver plates, gilt and ornamented with gold knot-work, and further enriched with gems and crystal.

The present example may prove suggestive for designs for various uses, but especially for fretwork, to which this class of pattern lends itself admirably. It is also an effective style of ornament for embossed leather work.

The border (Fig. 2) dates from the seventh century, and adorns the crosier, or rather, the pilgrim staff, of a certain pious princess and saint, named Dympna, who once lived in co. Monaghan, but having for some reason fled to Belgium, she founded a religious house and church, which still bears her name, at Ghent, where she has always been regarded as the patroness of the insane. This design, though rude in conception, is not without some weird grace, and might, if modified and improved, form a good border for repoussé work.

Fig. 3 is an example of a grotesque animal interlacement, and is enlarged and adapted from a minute design occurring in part of a large initial letter in the "Book of Kells," now in the library of Trinity College, Dublin. Reversed and duplicated, this design will be found suitable for various kinds of art work.

Fig. 4 is, I confess, not beautiful, nor is it exactly true to any original, but was suggested by a very minute design upon the "Tara brooch," with which many of my readers are doubtless familar, and which is an object of great interest to all antiquarians, as it is a gem of ancient metal work, and is certainly of great antiquity, although there is no distinct clue to the date of its manufacture. The design is suitable for repoussé, and when enlarged, forms an effective panel.

Fig. 5 is another specimen of interlaced ribbon work taken from one of the most precious and interesting examples of Keltic metal work, the Ardagh chalice, dating most probably from the close of the seventh century.

HOW TO SECURE COPYRIGHT IN DESIGNS.

BY CHARLES KELSEY.

MARKING THE FINISHED ARTICLES—SEARCHES FOR DESIGNS—EXTENT OF COPYRIGHT—NO RENEWALS—WHAT CONSTITUTES AN INFRINGEMENT—FRAUDULENT AND OBVIOUS IMITATIONS—PENALTIES—INSPECTION OF EXPIRED DESIGNS — EXHIBITION RECOMMENDED — CONCLUSION.

In my former papers I have brought the reader up to that point when he gets his certificate of registration issued to him. There yet remain certain other points, which I will deal with in this concluding paper.

Marking the Finished Articles.—The Act directs that the finished goods to which a registered design has been applied, should, before delivery on sale, be marked in a certain way—those which belong to classes 1 to 12 should be marked "Rd.," and the number given by the Office upon registration as "Rd., 15423"; those in Classes 13 and 14 should bear simply the mark "Regd." If this is not done, the registration will be invalidated, unless the proprietor can show, to the satisfaction of the Court, that he took all proper steps to ensure the goods being so marked.

This regulation is to let the public see that the design is registered, so that no person could allege that he was not aware of the fact; for, by examining an article, any person can see whether it is registered or not. This marking is sometimes difficult to perform on some articles, from various reasons; but then labels or tickets should be used, either attached to or connected in some way with the article. In Class 13—*i.e.*, the textile piece goods class—the mark is usually put only upon the end of a long roll of the material, so that in these cases many pieces of even yards in length might be cut off, and circulated amongst the public, without bearing any indication that it is a registered design, which is not open to imitate or reproduce.

Searches.—If, in such cases, it is proposed to reproduce a design—perhaps an order has been received for execution—and there is reason to think it is a registered pattern, this can be decided by sending to the Office a Search Form, "N," costing 5s., and two representations of the design. The Comptroller will institute a search, and inform such a person whether the design is one in which a copyright is still existing. If it is, he will give him the name and address of the proprietor, and the date of registration, so that the time the copyright has to run may be easily calculated. If the article bears a registration number or other mark, similar particulars will be sent if a copy of the mark is furnished on the same form "N."

These searches are also useful to find out if a design has been anticipated before making an application; or if an action for infringement is threatened, a search may, perhaps, reveal other designs, which would bar the threatened action by revealing anticipation. In cases where the registration number appears upon the articles, the information as to the proprietor and the date of registration may be got by the applicant himself, without paying any fee, by referring to the official journal of the Patent Office, sets of which are kept in the public library at the Patent Office; and sets are also kept at most of the public libraries in the chief towns of the kingdom.

Copyright limited to the United Kingdom.—The copyright granted refers only to the United Kingdom. Foreign countries have their own laws and regulations, which must be complied with before a copyright can exist in those countries. But certain rights of priority are given to the registered proprietors of this country by the International Convention, the practice for designs following, in nearly every particular, that applying to patents.

No Renewals.—After the expiration of the period of copyright the design becomes public property: it is open to anyone to produce or sell it, and the Act gives no power of renewal of the copyright in any case. It is not again eligible for registration, because, at this later date, it would not fulfil the conditions precedent to secure a valid registration—*i.e.*, being new or original, and not having been previously published in the United Kingdom.

What Constitutes an Infringement.—The Act says that the unauthorised reproduction of the design, or any fraudulent or obvious imitation thereof, constitutes an infringement, and it is also an offence to sell or exhibit for sale any articles to which the design or the fraudulent or obvious imitation has been applied, after the person so selling or exhibiting for sale has been warned that the articles in question are infringements of a registered design.

A recent amendment of the Act renders the person who causes to be applied such infringement, liable for penalties. Under the law, as it formerly stood, the greater sinner got off scot-free, whilst the person who had produced the goods on the order of someone else—such as a manufacturer producing for a merchant's order—was alone liable for damages.

Most cases turn upon the meaning of the words, "any fraudulent or obvious imitation thereof," and the question whether it is an "obvious imitation" is determined by the eye of the judge who tries the case. After hearing evidence from each side, he, as it were, puts to himself this question—Could the imitation be passed off upon an ordinary

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person as the original design, say in the case of a person ordering from a sample of the original design, and being supplied with the infringement in execution of the order? If the infringement is close enough to deceive such a person, in such an instance, it would be deemed an "obvious imitation" within the meaning of the Act. In one case, a person set his designer to work to produce certain designs, which should have the same general effect to the eye as some prior registered designs which he supplied the designer with. He directed him to vary all the details, so that they could not be said to be exact copies of the registered designs, but he was at the same time to preserve the same general effect. The Courts held that these were "obvious imitations" of the registered designs, saying that if the first designs had not been brought out, the imitating ones would have had no existence.

The question of "fraudulent imitation," turns mainly upon the evidence of fraud or fraudulent action of the persons producing the imitation which is put before the Court; in some cases, this term seems to have a wider sweep than the terms "obvious imitation." A common defence to an action is to set up a counter-plea that the registered design was not new or original at the date of registration, or was published before that date, and, therefore, not entitled to be registered; and if this plea succeeds, the original action falls through, and the Court makes an order for the design to be struck off the register.

Penalties.—The Act says that a penalty not exceeding £50 may be claimed for every offence by the registered proprietor of the design, who may recover such sum as a simple contract debt by action in any Court of competent jurisdiction.

The registered proprietor may, if he elects to so so, bring an action for the recovery of any damages arising from the infringement.

Inspection of Expired Designs.—On the expiration of the term of copyright all designs are open to inspection by the public. Any person may do so, any day between the hours of 10 till 4 p.m., at the Designs Branch of the Patent Office, and copies may be taken, but a fee of 1s. for every quarter of an hour is charged. This fee acts practically as a seal of secrecy on the expired designs, and if this regulation could be abolished and the designs publicly exhibited, a very valuable mine of information would be at the disposal of the public. The patent specifications, and the registered trade marks, are open for inspection free of charge, and there seems no valid reason why the expired designs should not be treated in a like manner. No doubt, interested parties may object to their designs being publicly exhibited, after their term of copyright had expired, but they could have little real ground for complaint, as the fundamental principle of the law is, that the grant of exclusive copyright for a limited time is to be repayed, by the public having the full benefit of the design or invention after that term has expired.

In the present day, when the questions of technical education, museums, and exhibitions are so much to the front, it seems strange that this large collection of expired designs have not been utilised. The value of such a technical museum or exhibition as might be formed from the expired designs, could not be overrated, especially if developed by some experienced person, who had sufficient knowledge of technical requirements, and true notions as to the good in industrial art, to be able to winnow away the chaff and select for exhibition the true grain, worthy of being imitated, and such as would tend to the education of the students frequenting the place, and to raise the standard of excellence in industrial art and design. The value of such a museum or exhibition would be enhanced by the fact, that these designs are the actual things which are finding a sale in present-day markets. The exhibition of a collection of unique and ancient articles, such as form the bulk of our museums for the advancement of industrial art and design, is, without doubt, valuable to the designers for present-day markets, and is, of course, highly interesting from an historical point of view; but it is open to the oft-urged objection that the articles are, in many cases, totally unfit to serve as models for imitation in the present day, when the wants to be met are so different, the conditions of sale so altered, and the methods of production so totally revolutionised.

There is another point which tells in favour of such an exhibition: here the designs are ready to be used, and will cost nothing, whilst the cost of acquiring a collection of rare and unique articles is naturally very considerable. The number of designs available is also always increasing, and there seems no reason why grants of these designs may not be made to localities, in the same way as the patent specifications are granted, to furnish the local technical museums; which are now, under the fostering influences of the "Technical Instruction Act," springing up all over the country. Of course, experience would be wanted in the selector, so as to ensure localities securing what would prove most valuable to their special industries, and what would tend to develop a correct taste in the students who would take advantage of them.

The institution of such an exhibition or museum, in conjunction with the Designs Office, would be highly valued by designers generally, and, if properly brought to their notice, would be largely used, and, at the same time, would do much to popularise the Office, and bring its proffered advantages more clearly home to the class whom the law is so well adapted to benefit—the ingenious artisan, worker, or designer.

Under present circumstances these advantages are much more largely acquired by manufacturers in a large way of business—who frequently register hundreds of designs in a year—than by the individual designer, who can thus create a property in his work, and in many cases enhance its value in the eyes of the manufacturer, to whom he offers his design for sale; for an exclusive right to manufacture means cutting off competition, and ensuring a sale at a price which will yield a fair profit to all concerned.

It is my fervent hope that these papers will do something towards bringing the knowledge of the advantages which are open to all, prominently before that very wide class of workers who weekly or monthly peruse these pages. The subject on which I have been writing is one that is of the utmost importance to many readers of WORK, and if I appear at times to have been somewhat prolix and precise, I must ask indulgence on the plea that I have been desirous of leaving unsaid nothing that might be said, or should be said. I have spoken of this in the concluding paper of this series, but I may as well say that there is another to come on "Copyright in Sculpture," which was promised in my first paper.

SPECIFICATION OF WORKS FOR ERECTION OF A PAIR OF COTTAGES.

BY W. BENNETT.

DESIGNS FOR A PAIR OF COTTAGES.

THE designs submitted are for a pair of cottages; they are designed for the purpose of meeting the requirements of the many readers of this valuable paper who write asking for a design for a pair of cheap and substantial cottages, and whose wants, I trust, will be satisfied with what I now bring under their notice. In the illustrations it will be found that the cottages are economically and comfortably arranged. They consist of a parlour, kitchen, scullery, pantry, etc., together with a small porch, which give the buildings an architectural effect.

It will also be seen, by referring to the chamber plan, that there are provided three bedrooms to each cottage. The mullion windows are to be provided with 1½ in. sashes, to open inwards. You will see by referring to my specification what materials I would advise in their erection. I estimate the cost of the cottages, with 9 in. interior walls and 14 in. exterior walls, to cost the sum of £300; if 4½ in. walls be used for the interior and 9 in. for the exterior walls, their cost will be greatly reduced—from £300 to £240.

EXCAVATOR.

Trenches.—Make perfectly level the bed of all trenches for footings and consolidate the earth about the same, and against all drains, walls, etc.

Concrete Foundations.—To make an artificial foundation to the entire buildings, the same to be composed of one part of the best fresh quickstone lime to six parts of unscreened coarse stone ballast, mixed thoroughly with each other.

SPECIFICATION OF WORKS—BRICKWORK.

Brickwork.—The whole of the exterior brickwork to be of the best red pressed bricks, first quality, laid on mortar, compounded of one-third well burnt stone lime and two-thirds of clean sharp sand, free from salt. The bricks are to be properly bonded together in old English bond, and no four courses to rise 1 in. beyond their collective height.

Brickwork, Interior.—The whole of the interior brickwork to be the best clamp bricks, hard, square, and free from shakes and cracks, and to be laid on mortar, as described above.

Damp-proof Course.—Lay throughout the length and thickness of walls and jambs a course of pitch and tar well boiled, or a layer of roofing felt well soaked in pitch and tar, the same to be ¼ in. in thickness, to prevent the damp from rising.

Gauged Arches.—All front and back windows to have the best gauged arches, abutting on proper skew-back, the soffit and reveals to be 4½ in., all outer openings to have plain axed and cambered arches closely set and pointed in cement.

Brick Strings and Cutting.—Properly form the string courses, fascias, breaks, recesses, etc., shown by drawings (cutting and rubbing such of the work as may be moulded), neatly splaying angles, plinths, etc.

Fireplaces, Flues, and Stacks.—Properly form all fire openings, with camber arches over the same, and trimmer arches where required for front hearths. Carefully gather in the chimney throats and carry up flues of not less than 14 in. by 10 in. in the clear, well pargeted. The stacks to be carried above roof to the height shown on elevations,

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with salient courses, etc., and properly fix the chimney tops hereafter described.

Chimney Bars.—Put chimney bars of wrought iron, 2½ in. by ½ in., and 18 in. longer than the chimney opening, properly caulked at the ends.

Bedding and Pointing.—To bed in mortar all the bond timber, plates, lintels, wood-bricks, templates, stone, and other work requiring to be set in the brickwork. To bed in and point round with lime and hair mortar all door and window frames, and back up and fill in with solid brickwork.

Encaustic Tiles.—Pave the kitchen and passages with 6 in. Maw's encaustic tiles laid on a 4 in. bed of concrete, the tiles to be well grouted over with cement when laid.

Glazed Earthenware Pipes.—Provide and lay drains with glazed stone earthenware socketed pipes, free from cracks, the drain to be laid to a fall of 2 in. in 10 ft., and jointed with tarred gaskin or cement. Provide and fix all proper junctions, syphons, bends, and traps, where requisite.

Jobbing. — Attend upon stone-masons, joiners, plumbers, etc., aiding and making good after them, and perform all jobbing necessary to perfect completion of works.

STONEWORK.

Doorsteps.—To put to all exterior doorways two 12 in. by 6 in. plain solid tooled steps of Whitby stone, the same to be 6 in. longer than the opening.

Chimney Stacks.—The chimney stack to be capped with a 6 in. stone, splayed at the top.

SLATING.

Slating.—Cover the roof with good scantle slates on sound heart of oak or fir, double laths and oak pins; no slate to be less than 20 in. by 10 in., and the whole to be well plastered against the pin with lime and hair mortar, the lap of upper slate over lower to be not less than 2 in. Properly cut double hips and eaves, and cut heading course.

PLASTERER'S WORK.

Plaster Walls.—Cover all the brick walls with simply one coat of paint cement: this cement to be worked to a fine surface with a wood float and carefully applied.

Ceilings.—Lath, lay, and float all ceilings with best lime and hair plaster.

Backing.—To back all plinths and architraves with lime and hair plaster.

Angles.—To form all angles and corners with Keen's cement.

CARPENTER'S AND JOINER'S WORK.

Sundries.—Provide and fix all required scaffoldage, centring, turning pieces, beads, stops, fillets, tilting fillets, backings, blocks, cradlings, firrings, bearers, and all such like required for erection of dwellings.

Bond Lintels.—Provide all necessary

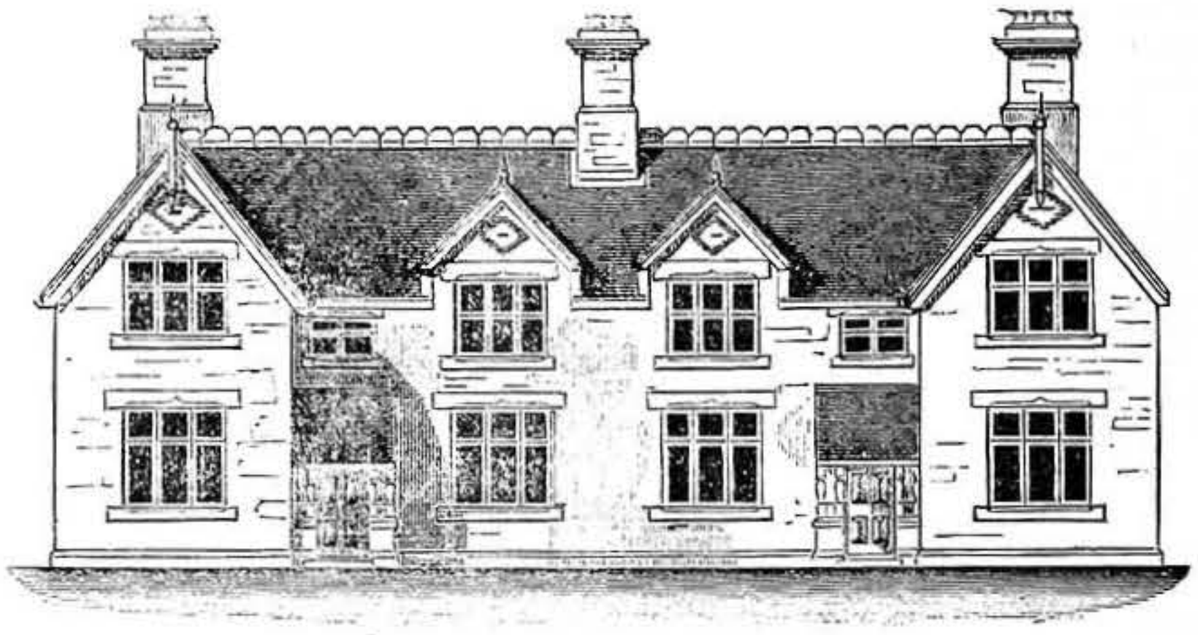

Fig. 1.—Front Elevation.

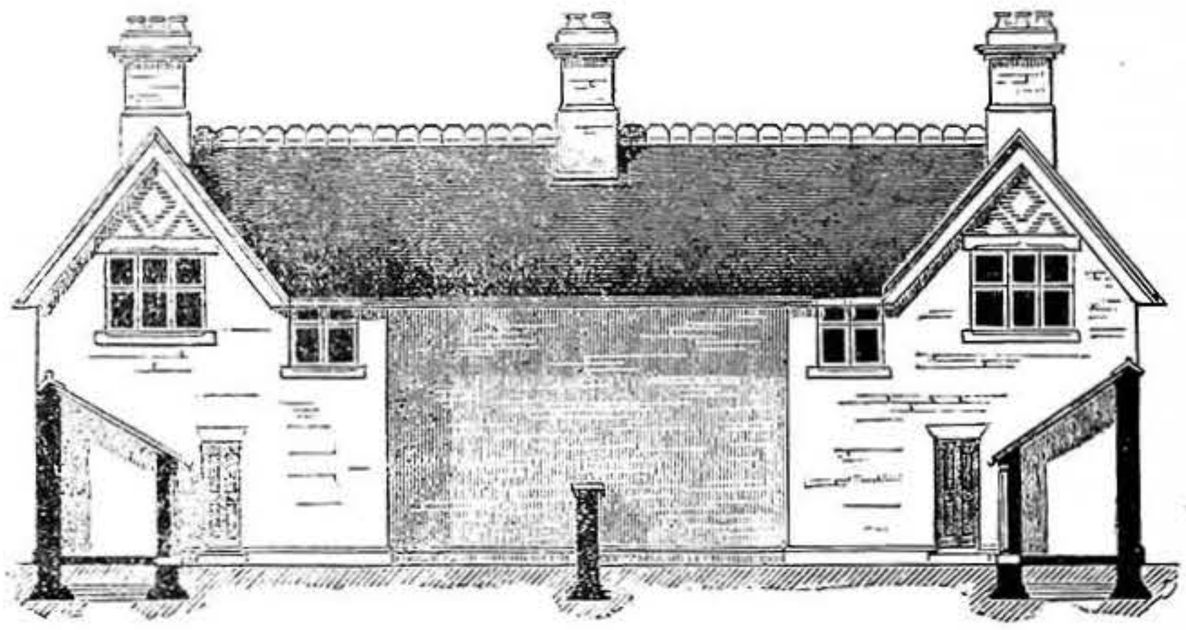

Fig. 2.—Back Elevation.

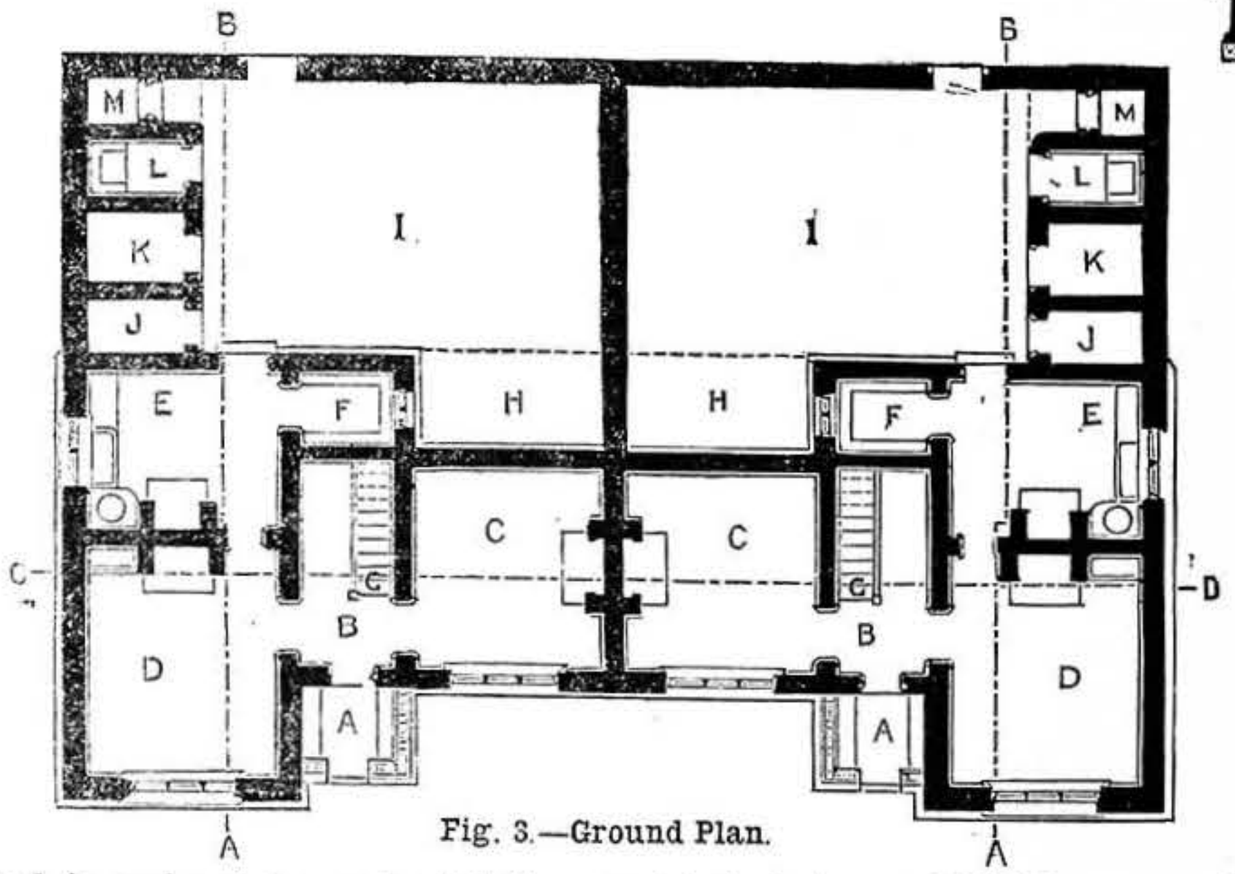

Fig. 3.—Ground Plan.

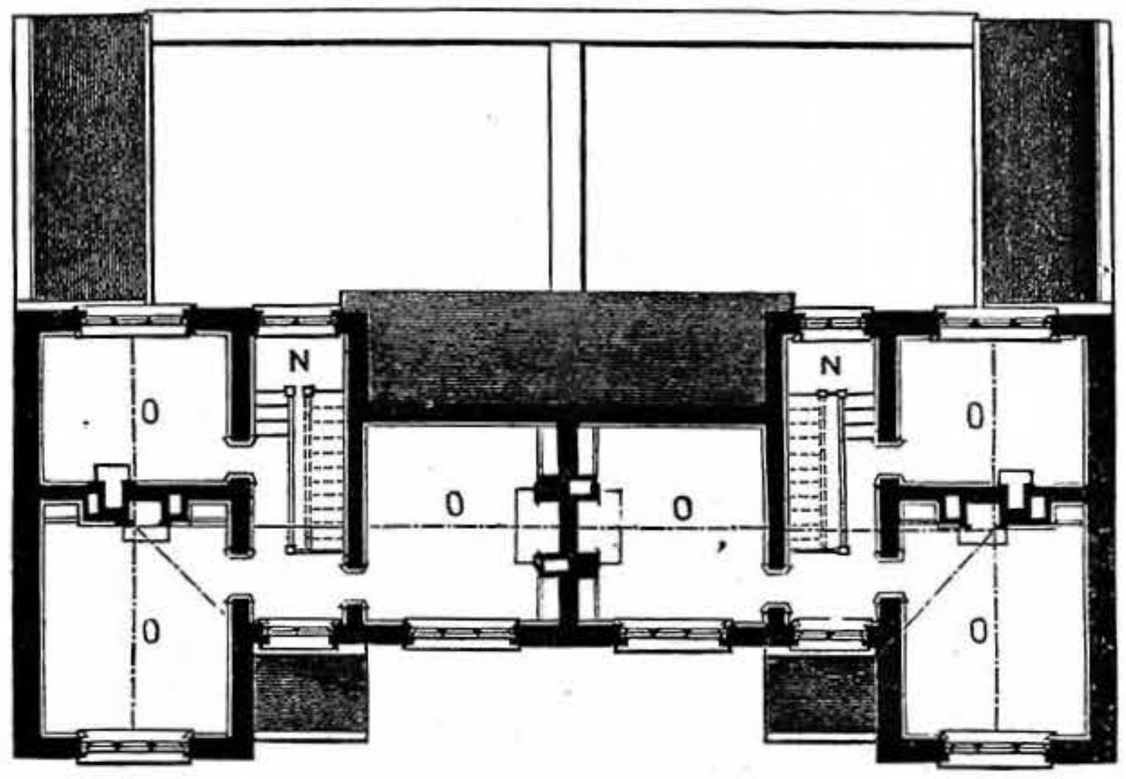

Fig. 4.—Chamber Plan.

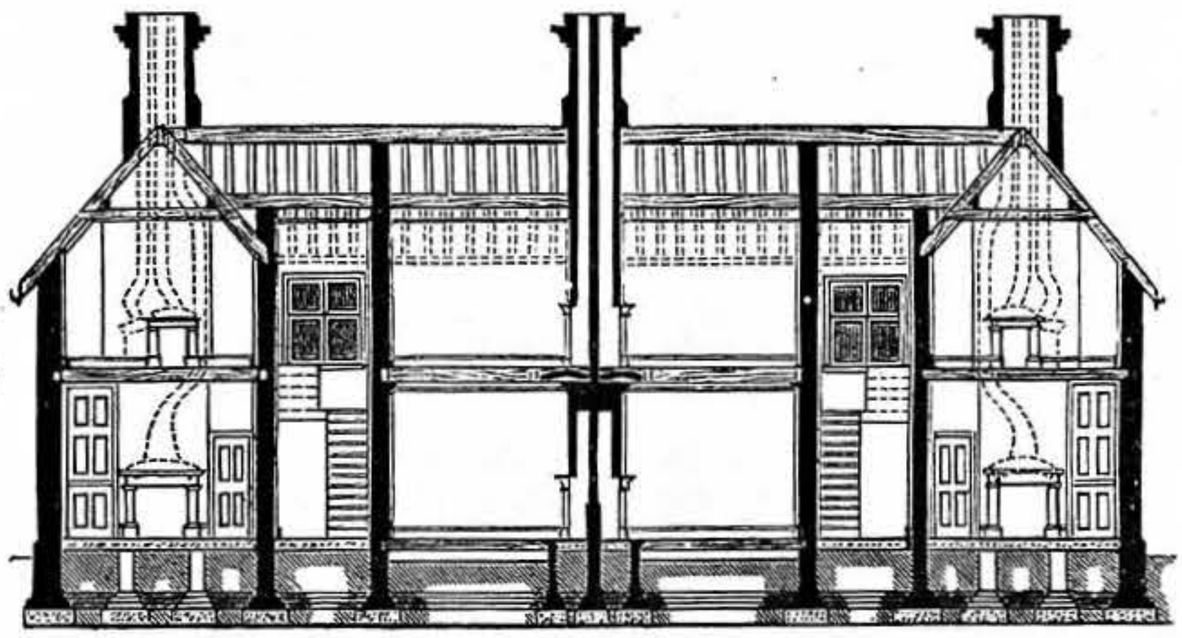

Fig. 5. — Longitudinal Section along Line C D in Fig. 3.

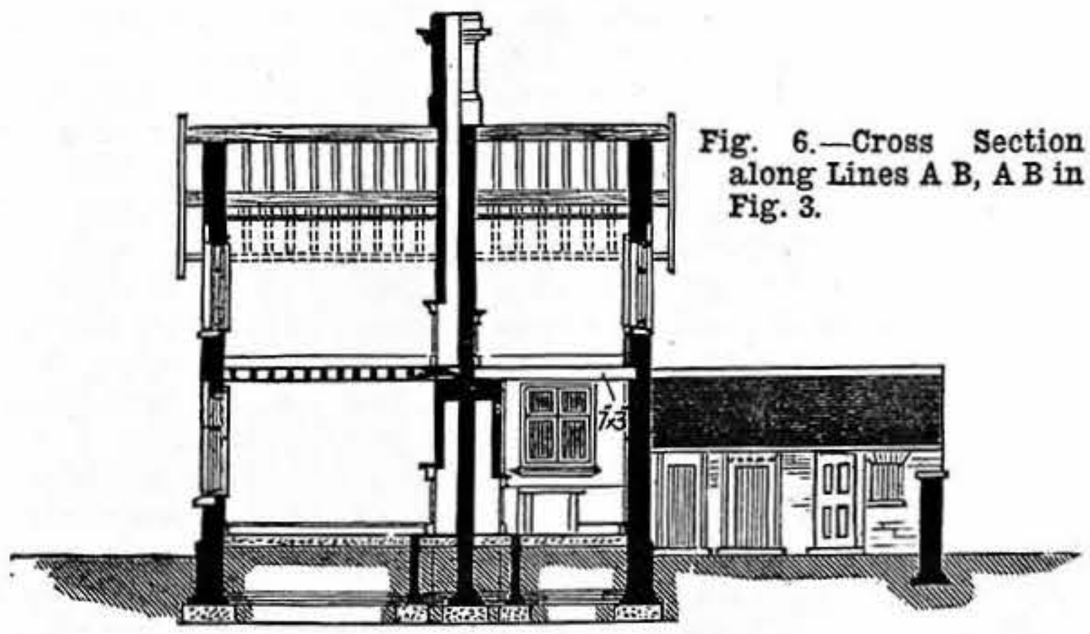

Fig. 6.—Cross Section along Lines A B, A B in Fig. 3.

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wood bricks and templates of sound Memel or red pine, free from shakes, sap, or dead knots, also lintels of Memel or pine over all window heads. All lintels used must have a vertical depth of 1¼ in. for every foot of opening.

Ground Joists.—All ground joists to be of sound pitch-pine, 4½ in. by 3 in., and 12 in. apart, and to be secured to wall plates, 4½ in. by 3 in., and to sleeper walls.

Ceiling Battens.—The joists of upper floor to have ceiling battens 1½ in. by ¾ in., and put 12 in. apart.

Roof. — The roof over building to be supported by trusses, as shown by the section, these trusses to be no more than 8 ft. apart; all scantlings to be of red wood, properly bolted together where required. The roofing spars to be 1½ in. by 2 in., and 12 in. apart.

Windows.—Provide all windows with mullions and sashes to open on pivots or hinges, also window-boards and architraves, and fix same.

Projecting Eaves.—Provide and fix a necessary woodwork to form projecting eaves, the fascia to eaves to be 7 in. by 1½ in., with bead run along under part.

Floors.—Cover all floors, except where otherwise described, with red deal floor boards ½ in. thick.

Doors, etc. — Provide and fix all doors, plinths, joists, lintels, seats, and all bond timbers where required in erection of dwellings, and make good after other trades for completion.

PLUMBER AND GLAZIER.

Windows. — Glaze all windows with 24 oz. glass, properly secured to sashes by beads, the upper part of the sashes to be glazed in small squares with leads, as per drawing.

Eaves Spout.—Provide and fix 6 in. by 4 in. eaves spout securely fixed to fascia.

Fall-Pipes.—Provide and fix all fall-pipes where necessary, with proper bends and heads to same.

PAINTER'S WORK.

The whole of the outside work to have four coats in oil and turps, plain colour; the inside to have three coats, exclusive of priming.

[The foregoing paper has been prepared in accordance with the wish of a correspondent, who asked for plan, etc., of a pair of cottages.—ED.]

KNOTTING, SPLICING, AND WORKING CORDAGE.

BY LANCELOT L. HASLOPE.

POINTING A ROPE—MAINSTAY—SHEAR-LEGS—HAMMOCK CLEWS—STERN LADDER—MAT MAKING—CONCLUSION.

Pointing a Rope is done partly to prevent it from untwisting, and partly to make it go more readily through a block or hole. Fig. 135 gives one manner of doing this. The rope is first unlaid for the necessary length, and the strands reduced gradually. They are then laid up again. The ends are finally whipped with small twine. If the end is not strong enough without it, a piece of stick is inserted to stiffen it. Sometimes a "becket"—that is, a piece of small line with an eye at the end—is put into the end and whipped over to secure it, as in the engraving. Fig. 136 gives another more elaborate way of doing the same thing. The rope is first unlaid, and a stop put on it where the unlaid part commences. As many yarns as are required are taken out and made into nettles by twisting together the two halves of different yarns. The remainder of the yarns are scraped down taper with a knife. Half of the nettles are turned back on the standing part of the rope, and the other half allowed to lie on the scraped part. Two or three turns of twine are hitched round the division of the two sets of strands, and the nettles laid backwards and forwards, the weft being passed each time, as described in making the fender (Fig. 131). The end is usually whipped and a seizing put on the upper part, which is snaked, as shown in the figure, by passing twine diagonally under and over the outer turns of the seizing alternately—that is, if it comes out over the upper turn, it will go under the bottom one, under the top, and so on until it is finished.

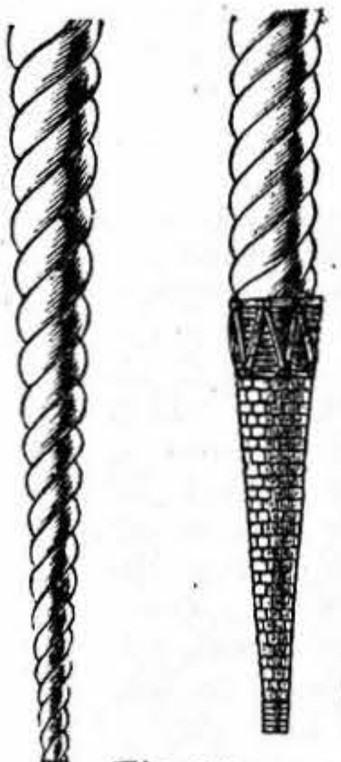

Fig. 135.

Fig. 136.

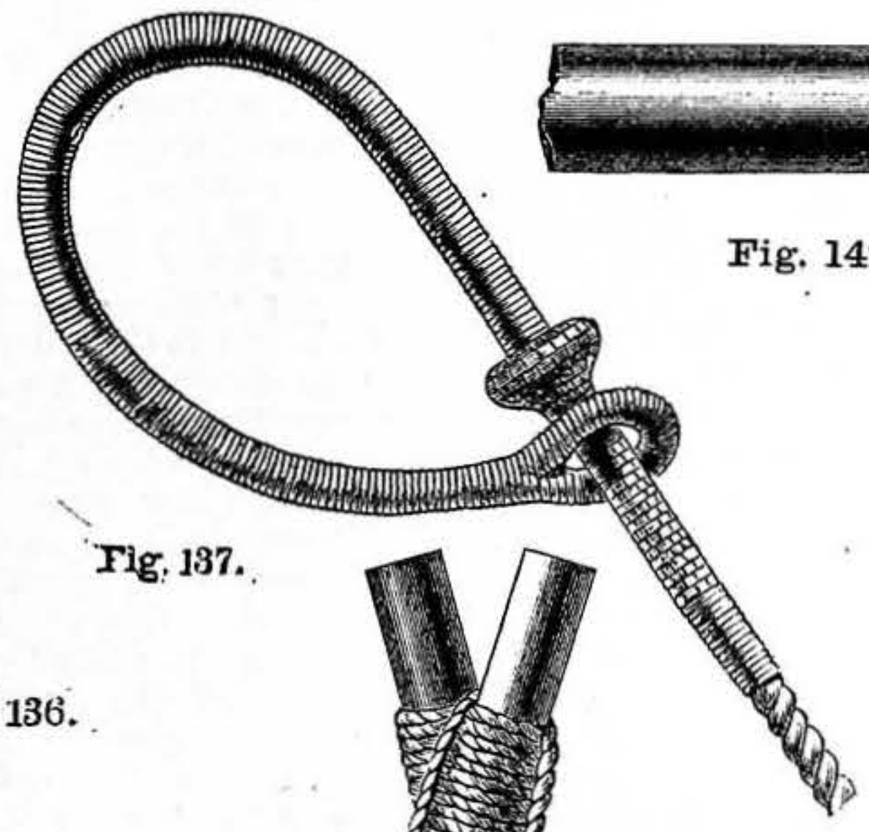

Fig. 137.

Fig. 142.

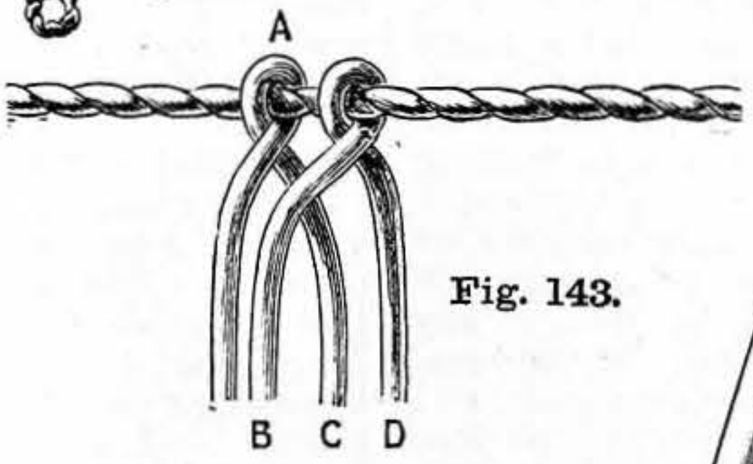

Fig. 143.

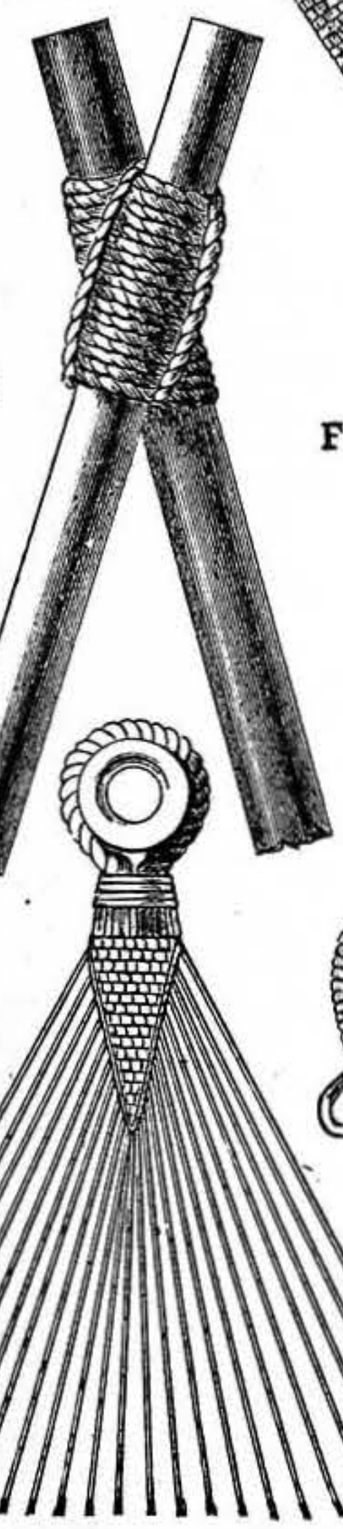

Fig. 138.

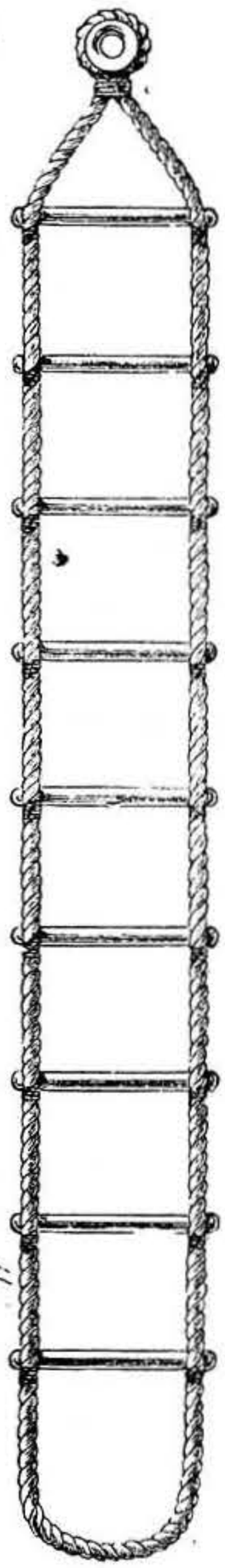

Fig. 141.

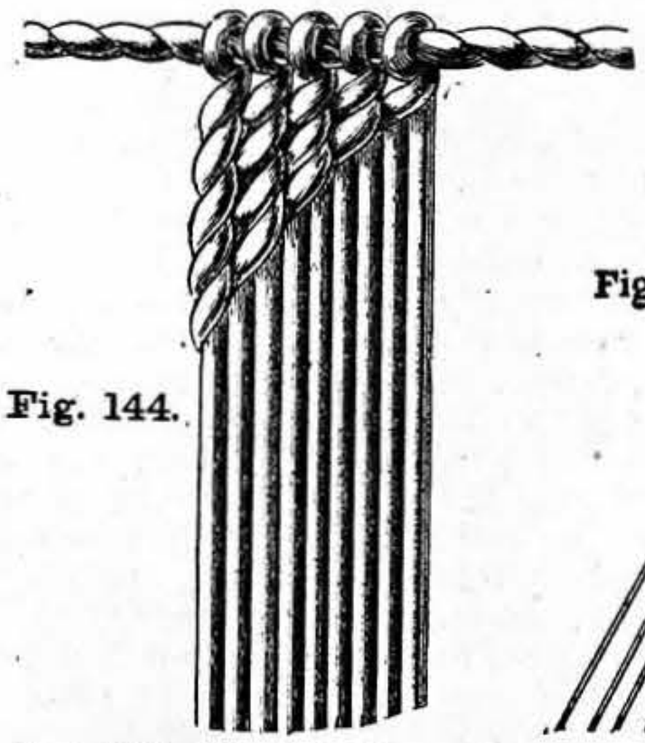

Fig. 144.

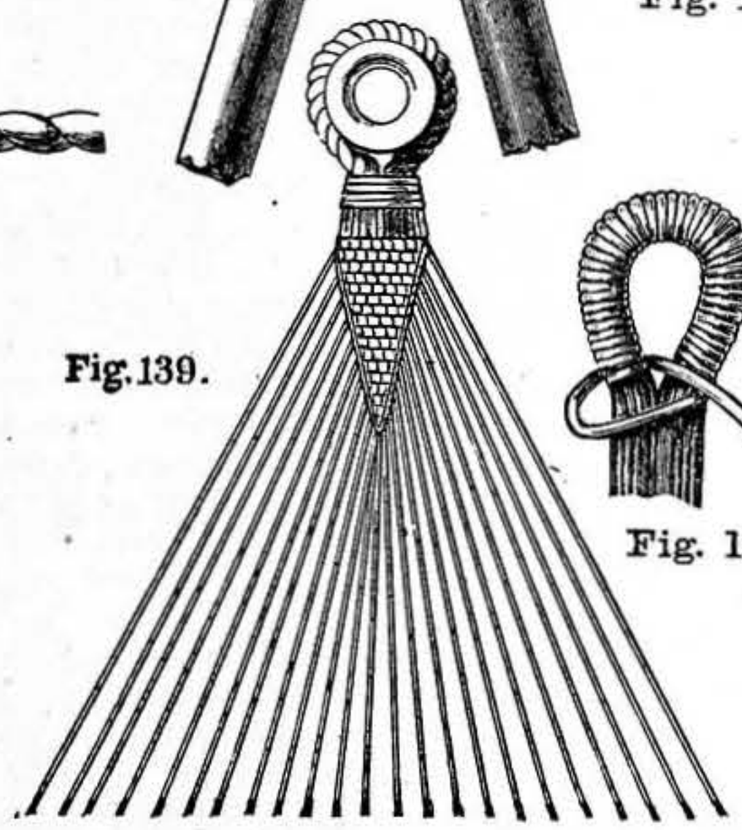

Fig. 139.

Fig. 140.

Figs. 135, 136.—Pointing a Rope. Fig. 137.—Mainstay. Fig. 138.—Shear-Legs. Fig. 139.—Hammock Clews. Fig. 140.—Alternative Loop for Hammock Clews. Fig. 141.—Stern Ladder. Fig. 142.—Round of Ladder. Figs. 143, 144.—Mat Making.

Fig. 137 is part of a *Mainstay*. An eye is first made in the end, and a mouse the shape of a pear raised on the rope with spunyarn. Each turn of the yarn is hove well taut with a large serving mallet, and beaten close. The eye and the rope as far as the mouse are wormed, parcelled, and served over; the mouse and the part below it, which is called the tail, is parcelled with worn canvas, well tarred, and pointed over or grafted with small stuff. The mouse must be covered with nettles, and their number diminished as they are worked into the smaller parts. Below the pointing it is again served over.

Fig. 138 shows the way *Shear-legs* are fastened together. They are first laid side by side, and a lashing of rope put round them. The ends of the lashing are carried one up and the other down to form a cross-lashing, and are knotted in the middle. This is called a Portuguese knot. When the legs are separated, the knot becomes very secure.

The *Clews*, or small cords of a hammock by which it is slung, are usually about the size of fishing-line, but the dimensions of the cords vary according to the number of clews the hammock contains. As in other cases that I have mentioned, the pieces of cord, when cut to their proper length (about 3 ft.), are called nettles. Lay them all together with the ends even. Take hold of them and give them a twist or two in the middle, and put a thimble in the bight and a stop under the thimble. Now divide the nettles into two equal parts, holding the eye in the left hand upside down. Take one of the nettles from the outside on the right,

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and lay it across the space between the nettles; do the same with a nettle from the outside on the left; haul upon these till they lie snug down in the divisions between the nettles. Now change the position of the nettles by taking one from the right and laying it over on the left, at the same time taking one from the left and placing it over to the right; repeat this alternately until all the nettles have changed places. Pull them well down, so as to make a clear division between them. Then take two nettles, one from either end of the work, and, crossing them, lay them down in the parting as before. Change the other nettles from side to side, as before, and continue working this way until all the nettles are used up. The last pair of nettles in the middle are knotted. Another pair of nettles being used up every time the nettles are crossed over, the worked part becomes taper, as shown in Fig. 139. The ends of the nettles should be whipped to prevent their unlaying.

A *Hammock*, as I daresay my readers know, is usually made of canvas, and is about 6 ft. long by 3. ft. wide. The ends are turned over and hemmed down, and a row of eyelets, in number equal to the number of the clews, are punched along it at equal distances. The nettles are rove through these, and secured with an overhand knot or two half hitches. When neither thimbles nor eyelets are at hand, an eye may be formed at the end of the clews by serving over the middle of the bundle of nettles with some of the nettle stuff, and then bending it into an eye. The easiest way to do this is to put two half hitches over a hook or anything that is convenient, and, standing at the full length of the serving stuff, gradually wind it on to the bundle of nettles by turning them round and round. The first end is secured by being stowed away among the nettles and served over. The last end of the serving stuff is brought round and through the eye, then round the front of the right part of the eye, round through the eye, and round the left side as at first. This must be repeated thrice, hauling well taut as you go. The end is then brought down, passed through the centre of the nettles, up through the eye, and round the lashing just made, where it is hitched; this must be repeated, and the eye will be secure. In the place of eyelets a hole may be made in the canvas with a pricker, and a small grommet inserted; this must be worked over in button-hole stitch with sailmakers' sewing twine. Of course, the first is the neater method, though the second is quite as strong. Two clews are required for a hammock, one at each end, and it is slung by two ropes spliced into the eyes of the clews.

Fig. 141 shows a *Stern Ladder*. This is made of four-strand rope; the rounds are turned out of oak in the form shown in Fig. 142. The groove at the ends is for the reception of the strands of the rope. The rounds are rather more than 1 in. in diameter, and are placed 11 in. apart. The strands are opened with a marlinespike and the rounds inserted between them, two on each side; a seizing is put on below each round; a round thimble is put into the upper bight, and an eye seizing is clapped on below it. The lower ends are generally spliced together, or a thimble may be spliced in, as at the upper end, if it is intended to make the lower end fast.

Mats are used on board ship to prevent chafing. In making wrought mats a piece of small cord is stretched tight horizontally at about the height of a man, and fastened at each end. Across this, hanging by their middles, nettles are placed. These are often made of "foxes"—that is, three or more rope-yarns twisted together by hand, and each rubbed down with tarred canvas or a handful of rope-yarn. Beginning with the nettle nearest the left hand, it is crossed as A (Fig. 143). Another nettle is then brought up close to the first, and crossed in the same way. The end B is then passed over the strand C, and pushed to the back; another nettle is then brought forward, crossed as before, and one part of it put over the part D, and pressed back. The work is continued this way, working diagonally until a sufficient width is obtained (Fig. 144); then, as no more nettles are added, and the outside nettle on the right is brought over from time to time, a selvage is formed as on the left side. Care must be taken to twist each of the nettles together at the bottom, so that they may retain their twist until the next in succession is brought down to interweave with them. There is a little difficulty at starting, but afterwards everything goes on easily. Each nettle from the right passes over the next one to it on the left, and is pushed back, the one that has been passed over being taken up first over the next and pushed back as before. Each twist should be pressed tight as it is made. When the mat is deep enough, a selvage is made by straining another piece of cord along the bottom, securing both ends. As each nettle comes down it is half hitched to this, and the next nettle is laid up at the back of it, and so on alternately. Mats are frequently thrummed, which is done by raising the nettles that lie on the top of the mat with a marlinespike or pricker after it is finished, and putting short pieces of the nettle stuff underneath. The thrums are then cut off to the same length, and opened out. Of course, wrought mats may be made of any material and used for a variety of purposes. They make most excellent door-mats, and are of everlasting wear. For this purpose they should not be made of tarred stuff. Very pretty mats may be constructed of twine for the foundation and various coloured pieces of worsted for the thrums.

There is another kind of mat used aboard ship called a sword mat. It is made in the same manner that weaving is done, only no loom is used. Two small cords, or, better still, two small rods, are secured horizontally and the nettle stuff wound round them, the coils being laid close together. A piece of wood called a "fiddle," as long as the width of the mat and about 2 in. wide and $\frac{3}{8}$ in. thick, has half as many holes bored near the lower edge as these nettles in the mat. Every alternate nettle is secured to this by some twine laced through the holes. Another fiddle is fastened in like manner to the remaining nettles. The work is now ready to be commenced. The first fiddle is raised, and the first set of nettles consequently raised with it. What weavers call a "shed" is thus formed—that is, an opening between the two sets of nettles, along which the weft or filling is passed with the help of a netting-needle. The filling is driven well home with a flat piece of wood, tapered towards the edge, called a "sword." The first set of nettles are now allowed to drop, and the second set drawn up with the other fiddle. The filling is passed again and driven home as before. The work is thus continued until there is no longer room to use the sword, when the filling must be worked home with a pricker. When the mat is long enough, the filling is fastened off, and the mat is complete. These mats may be thrummed in the same manner as the wrought mats. A softer kind of mat is made on a foundation of canvas or duck, which is very suitable for the stern-sheets of a boat or any other similar purpose. The material is cut to the right size and folded a short distance from the edge. A hole is made near the selvage with a pricker and a thrum inserted; another hole is then made a short distance from the first and another thrum put in, and so on until the row is completed. Row after row is thus worked until the mat is finished. Of course the holes, and consequently the thrums, go through both parts of the material. When the canvas is pulled straight after each row is finished, the thrums are held securely without any other fastening. When a pattern is to be worked on the mat, the design must first be drawn on the material in pencil and the canvas folded accordingly. It must be remembered that every fold produces two rows of thrums. White duck thrummed with pieces of cotton rope makes very nice, clean-looking mats for boat use, and as they wash beautifully, they can always be kept in good order. These mats, with a stout canvas or sacking foundation, thrummed with pieces of untarred hemp rope, serve very well for door-mats, though, of course, they will not last as long as wrought mats. Very ornamental mats are made somewhat after the same manner as those just described. Any suitable material, of any colour, can be used for the foundation, on which the pattern must be drawn. The mat is folded along the line intended to be worked, and a common pencil laid along the ridge of the fold. The worsted or other material used is threaded in a large needle, and worked over and over the pencil, thus forming, when the pencil is withdrawn, a series of loops on the foundation. Any pattern can thus be worked, provided always that it consists of straight lines. It might be possible, I think, to form curved lines by working the loops over the first finger of the left hand, moving the finger after each loop, but I have no experience of this. My lady readers will find mat making on this plan a very agreeable and useful employment, as really beautiful mats can be made by this method. I saw one a short time ago, made by a rigger's wife, which would not have been out of place in any drawing-room.

I have endeavoured with pen and pencil to give as clear an account as possible of the various knots and methods of working cordage in general use among seamen, and I hope my readers will soon master the subject. They will find it well worth their while to do so, as there are such a great variety of circumstances where a knowledge of knotting, splicing, and working cordage comes in usefully.

I have not touched on the subject of heraldic knots, partly because I considered it lay somewhat out of the line of my present purpose.

HARD STOPPING OR BEAUMONTAGE: ITS USE IN FURNITURE WOODS.

BY LIFEBOAT.

INTRODUCTION—PROFESSIONAL *VERSUS* AMATEUR WOODWORKERS—ITS USE TO THE FRENCH POLISHER—ITS ADVANTAGE OVER PUTTY OR BEESWAX AND RESIN—HOW TO MAKE IT—HOW TO USE IT—TREATMENT OF CRACKS, BRUISES, BLISTERS—COLOURED BEESWAX—FINISHING.

Introduction.—"It's beaumontage sir," said the boy, when asked by one of his father's customers what he was using. "Yes, but I ordered it to be made of wood, not that

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stuff," was the rejoinder. "But this is harder than wood, sir." "Harder than wood, is it? Then tell your father to make me one of all beaumontage."

So the story is told; but whether the boy had been too liberal with its use, using it where wood ought to have done duty, I will not say; but as putty is said to be the carpenter's best friend, we can say that to the French polisher and cabinet maker, especially those that do much in the way of repairs and repolishing—for the one often combines both callings—hard stopping, or beaumontage, *may* be his best friend, if he will use without abusing it, for if carefully selected as regards colour, it is difficult to distinguish it from the wood when polished over.

Professional versus *Amateur Woodworkers.*—The professional cabinet-maker, as a skilled workman, should make all his joints fit so closely, and arrange his nails and screws in such a position that their heads will be out of sight, and so leave no holes or defects to need filling up. But even he will find it difficult to select all his wood and ensure himself against any slip or accident so that his work shall present no flaw, shake, or hole that would be none the worse for a composition that shall fill up all defects and render them sightly. True, there are many old stagers who cling closely to beeswax and resin in about equal parts for such a purpose, and they will tell you it suits their purpose very well, though in many cases they only keep two colours in stock—red for mahogany and brown for walnut; at least, the writer so concludes, judging from work that daily passes through his hands.

It is not so much for the professional, who, as I have said, has little need for such a composition as beaumontage, that this article is penned, but for their less fortunate brothers who have to depend largely upon repairs and chance jobs for their livelihood, and for those of our readers, amateur or otherwise, who may have been, or may be, tempted to make some of the many useful or ornamental articles in wood, sketches and particulars of which are constantly appearing in the pages of WORK, and who, perchance, may not have employers willing or at all likely to supply them with perfectly sound material to work with; and there must be some who have found it suit their means best to supply themselves with packing case or other cheap class of wood. In their case they will find it extremely difficult to so select their wood and cut it that no nail or screw-hole, or maybe flaw, shall present itself.

Its Use to French Polishers.—The polisher may be called upon to repolish furniture from which little bits of veneer are chipped off, or some bruise, crack, or blister may present itself. The cabinet-maker, with his glue-pot, veneer, and cauls at hand, might let in little bits of wood, or open the blister and run in some hot glue, and apply his cauls, hand-screws, or weights as may be required. Not so the polisher, who may be out of reach of any such help, setting aside the fact that to call in such assistance would take away all his profit, besides hindering him hours, or maybe days, before he could finish his job. Something that will enable him to make level all defects in a short time and enable him to at once proceed with his polishing is found in hard stopping.

Its Advantages over Putty or Beeswax and Resin.—If we use putty, in drying it always shrinks, showing plainly in the case of cracks and screw-holes an indentation. If it is used on white wood before staining and polishing its oily nature prevents the stains striking into the wood so deeply as in the parts untouched by it, so causing the work to have a somewhat patchy appearance. If we use beeswax and resin, its chief fault is the want of variety, the colours of which, as I have said, are rather limited, owing to its being kept at hand in most cases in an iron ladle or large spoon, which, by the way, are not the most convenient things for a polisher to carry with him in his kit when going away from home to work.

As hard stopping can be made up in an indefinite number of colours, like so many sticks of sealing-wax—though it is not "harder than wood," yet can, with care, be selected to match any wood we may be working upon, and will not shrink, but retain a level surface, and will, moreover, take polish well—sufficient has, I think, been said to show its superiority over beeswax and resin or putty.

How to make it.—The greater the variety of colours the more its usefulness becomes apparent. It gives one a better chance of matching, and ofttimes saves staining such as would be necessary if little bits of veneer are let in.

It can be bought ready-made, at most places where veneers and fancy woods are sold, at about one penny per stick, and is quoted as "stopping-out wax." It is sold by Mr. Palmer, a London shellac and gum merchant, at 1s. 6d. per lb. in various colours; but it is easily made, and one better appreciates anything made by oneself, as knowing its composition lends additional interest.

Having previously planed up two pieces of wood about ⅝ in. thick, 15 or 18 in. long, and 9 in. wide, one of which should be screwed on the bench, take a cupful of any common shellac, put it in a tin or iron pot (half-pound mustard or coffee tin will do), add a teaspoonful powdered resin, and a piece of beeswax the size of half a walnut; then add a teaspoonful of powdered lemon chrome; put it in the oven or on the top of a stove till the whole is melted, stir up with a stick to properly amalgamate, pour a little of the melted composition on the fixed board, then gather it up by means of a scraper or knife, and roll out between the hands, and while still warm roll out into sticks between the two boards by passing the uppermost or loose board to and fro. If the loose board is kept warm by keeping it before the fire when not in use, it gives a better result. Care must be taken not to get the composition *too hot*, as it spoils by boiling. It will require a little practice and, perchance, a few scorched fingers before perfection in the shape of perfectly round sticks is gained.

Having poured out sufficient to make two sticks of this colour, add a little yellow ochre, and make two more; this will give two shades that will do nicely for oak. Then add a little brown umber, warm up again, and roll out two more; those will do for light walnut. Add a little more umber and you are right for dark walnut. Follow on by filling up the tin with shellac, resin, and beeswax as required, adding Venetian red for mahogany, and black for rosewood, and finally finish up with black.

It will be seen that by varying the amount of dry colours any number of shades can be obtained, and it will be found better to take the colours in the order suggested. If the darker colours are taken first it will be found more difficult to obtain the lighter shades, owing to the darker colours clinging to the sides of the tin or pot.

How to use.—Any piece of flat iron will do that will retain heat for a few minutes. To give an idea of the most convenient size, I may say that an old worn-out 6 in. flat file in a handle will do admirably, especially if, for an inch or so from the point, the file cuts have been removed by the aid of a grindstone. Suppose it is a crack, nail or screw hole you wish to fill up, select a stick of stopping the required shade, bearing in mind that if it is white wood to be afterwards stained you are at work upon, it will be necessary to select your stopping as near as may be the colour the article is intended to be finished. Then, having your iron black (*not red*) hot, run the stopping into the defective part by holding the iron in the right hand and pressing the stick of stopping against it with the left hand, somewhat similar to the way you have seen the tinker using his copper bit and solder. Do this till you have it well filled up and a little over, then press it well in while the iron is still warm. When cold, clean off level with a sharp chisel, scraper, or knife, and glass-paper.

If it is a shallow bruise it will help the stopping to hold in better if we first make a few holes in the bruised part with a bradawl or chisel. If it is burr walnut, or other fancy figured wood, round holes are best; if straight-grained, such as bay or mahogany, a straight cut from a chisel or knife is preferable.

If instead of dents or cracks the work is blistered, make in it a number of holes—round or straight as required—run some stopping on, and press down with the hot iron. With care this is a far more expeditious plan than opening and putting hot glue underneath and applying weights or pressure. The stopping holds it down like so many pegs or nails.

Coloured Beeswax.—It will be found useful if we have at hand beeswax made up of various colours. Slight fissures in the veneers, imperfect joints, or if the stopping has not quite filled up, the defect may, by the aid of these, be made much more presentable.

Heel-ball or cobbler's wax, as one sometimes sees used, cannot be recommended, as it seldom takes polish well. If the coloured beeswax is made up in the form and size of heel-balls, it will be found most convenient, and can be made by oneself by melting and adding the various colours as suggested for stopping, then running it into moulds. The writer has found it a good plan to bore a few 1¼ in. holes through a piece of hard wood, about ½ in. thick; then screw this to another piece and run in the melted wax; when cold, unscrew the top piece—the wax is then easily removed.

Finishing.—Having shown how defects in new and old work can be rectified, it is unnecessary here to give particulars as regards French polishing; that has already been done in WORK. Enough for me and our purpose to remind my readers that, if the work is old and been previously polished, it will be found that in making good the defect its necessary cleaning off will leave a bare patch; this should be wiped over with a little linseed oil and "bodied up," allowing a few hours or over-night to elapse before the final bodying up and finishing.

French polishing has already attracted, and doubtless will continue to attract, the attention of many readers of WORK, for whom it seems to possess a marvellous fascination.

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A SMALL POULTRY FARM.

BY G. P.

COVERING FRAMEWORK: OF HOUSES, OF ROOFS, OF RUNS—DOORS: LEDGE DOORS, FRAMED DOORS — WINDOW — INTERNAL FITTINGS: NESTS, ROOSTS, LINING, FLOORS—FINISHING: PAINTING, GRASS PLOT—CONCLUSION.

IN my first paper I described the materials to be used, gave the dimensions of the various parts, and described and illustrated the method of constructing the necessary framework. I now proceed to show how to complete the work.

Covering Framework.—Having now got all the framework put together, we may proceed to cover it with the necessary materials. As already stated, Willesden Roofing is to be used for the roofs, and match-boarding for the other parts, although there is no objection to confining ourselves to Willesden Roofing, except that match-boarding will do as well seeing that the house is to be lined inside. One objection to covering with match-boarding is that it is affected by the weather. However, if it is kept well painted, this danger is considerably lessened. For the roof, however, it is an entirely different matter, and I would on no account recommend match-boarding, when Willesden paper is to be had so cheap.

Of Houses.—The framework of the houses, then, is to be covered with ½ in. match-boarding. When covering, however, remember to leave spaces for the doors and windows, as shown in Figs. 1 and 8. A small exit-hole must also be left in the match-boarding between the large house and the run, so that the fowls may enter or leave the house at pleasure. This hole should be about a foot square; the edges of the wood should be rounded off; and it should be furnished with a small door, sliding backwards and forwards on two runners, so that at any time communication may be cut off.

Of Roofs.—The mode of fixing Willesden paper on roofs is clearly shown in Figs. 4, 5, 6, and 7; there is therefore little need for a detailed description here. When speaking of the rafters, I said they were to be spaced 16 in. from centre to centre; this is so that, when the roofing (which is 19 in. wide) is laid on, the edge of one sheet laid vertically from eaves to ridge, and over the ridge to the eaves on the opposite side, will overlap the edge of the adjoining sheet 3 in. at every joint, and thus make a perfectly water-tight roof. The manufacturers tell us that, "In all cases Willesden Roofing must be fixed with outside wooden battens, 2½ in. by 1 in., and nailed or screwed through batten and roofing to the rafter beneath, in order to provide good holding. Nails or screws should not be less than 2½ in. to 3 in. long." Always follow these instructions (see Fig. 6). These outside battens should be of good wood, free from sap and large knots, and must receive three coats of oil paint before fixing. When cutting the roofing, care should be taken to allow sufficient to turn under the eaves board (Fig. 6), which bend may be easily effected by placing the *ends* in water for fifteen or twenty minutes, but *never* plunge in the whole sheet. As "accidents will happen even in the best regulated households," it is well to know how to repair any accidental damage. All that is required is to fix a piece of 1-ply Willesden paper on each side of the fracture, with a waterproof solution composed of white lead and best gold size. I have no doubt that Waterproof Liquid Glue would suit the purpose quite as well, although I have no experience of it. When the Willesden Roofing is fixed, and the fascia and soffit boards put on, the ridge will have to be made and fitted on (see Fig. 7), after which the small turned pinnacles (see Fig. 1) are fixed on. This completes the roof, and we will now turn our attention to the run, and the fence round the grass plot.

Of Runs.—With regard to the run, the framework circumscribing it must first be covered, 2 ft. up, with ¾ in. boards—of course, omitting the space which will afterwards be occupied by the door (see Fig. 1). This done, the remaining portion is covered with 2 in. mesh wire netting,* 2 ft. wide, and the edges of this are covered by nailing over them small laths, 1 in. broad and ¼ in. thick; this prevents the loose ends of the wire from tearing one's clothes, or scratching one's hands, should one happen to come in contact with them. The top is covered with similar wire netting, but first we must have supports on which to fix it. For these we shall require three pieces of wood 8 ft. 4 in. long by 1½ in. broad by ¾ in. thick; these are fixed at equal distances along the top. The top rails are rebated to receive them, as shown in Fig. 9; the ends of the supports are laid into these rebates and nailed down to the top rails. The wire netting is then laid along lengthwise, and fixed with small wire staples.

It is well to have a portion of the run covered at the top, so as to afford shelter for the fowls in rainy weather. The Willesden Roofing may be used for this also. Before fixing the wire round the grass plot, it is well to nail a narrow board at the foot of the posts round the plot. This furnishes a firm hold for the wire netting at the foot, so that there will be no possibility of small chickens escaping under the fence. The board should be 4 in. wide by ¾ in. thick. It should first be well tarred, and then

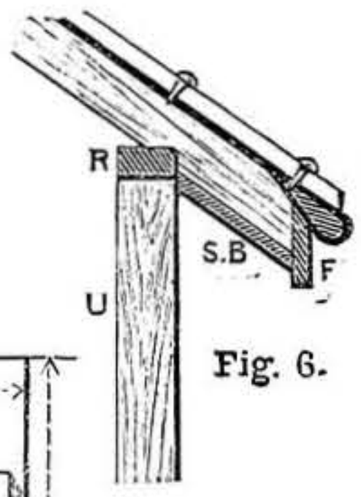


Fig. 6.

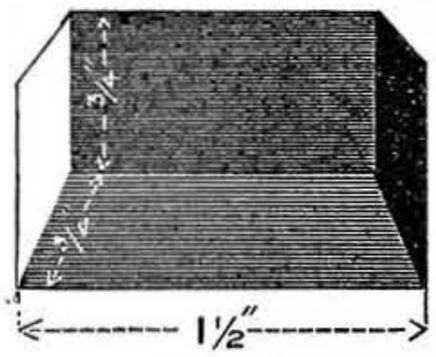
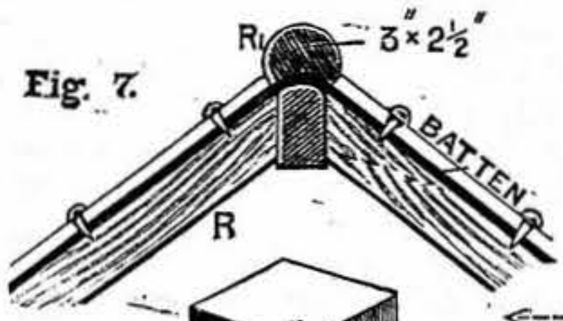


Fig. 9.

Fig. 7.



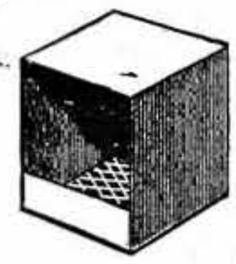


Fig. 12.

Fig. 10

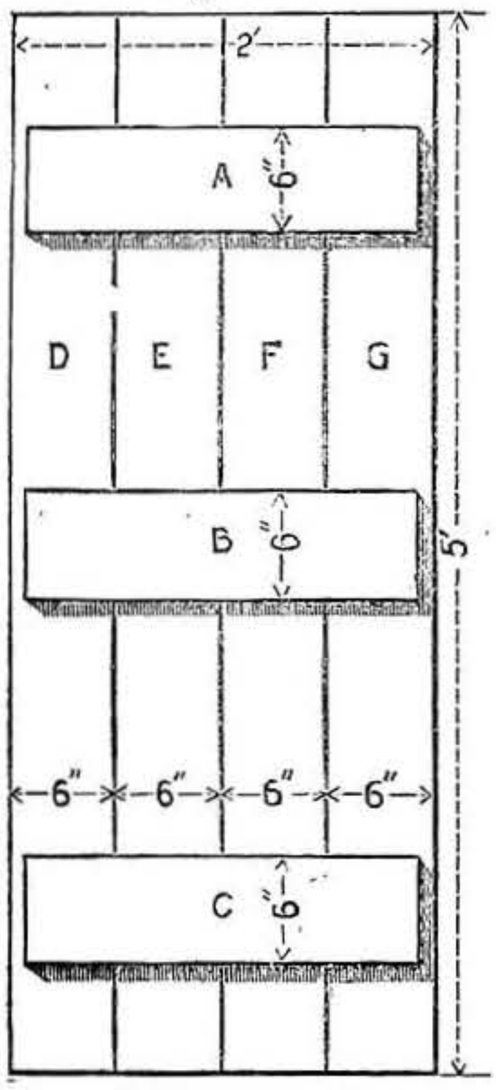


Fig. 8.

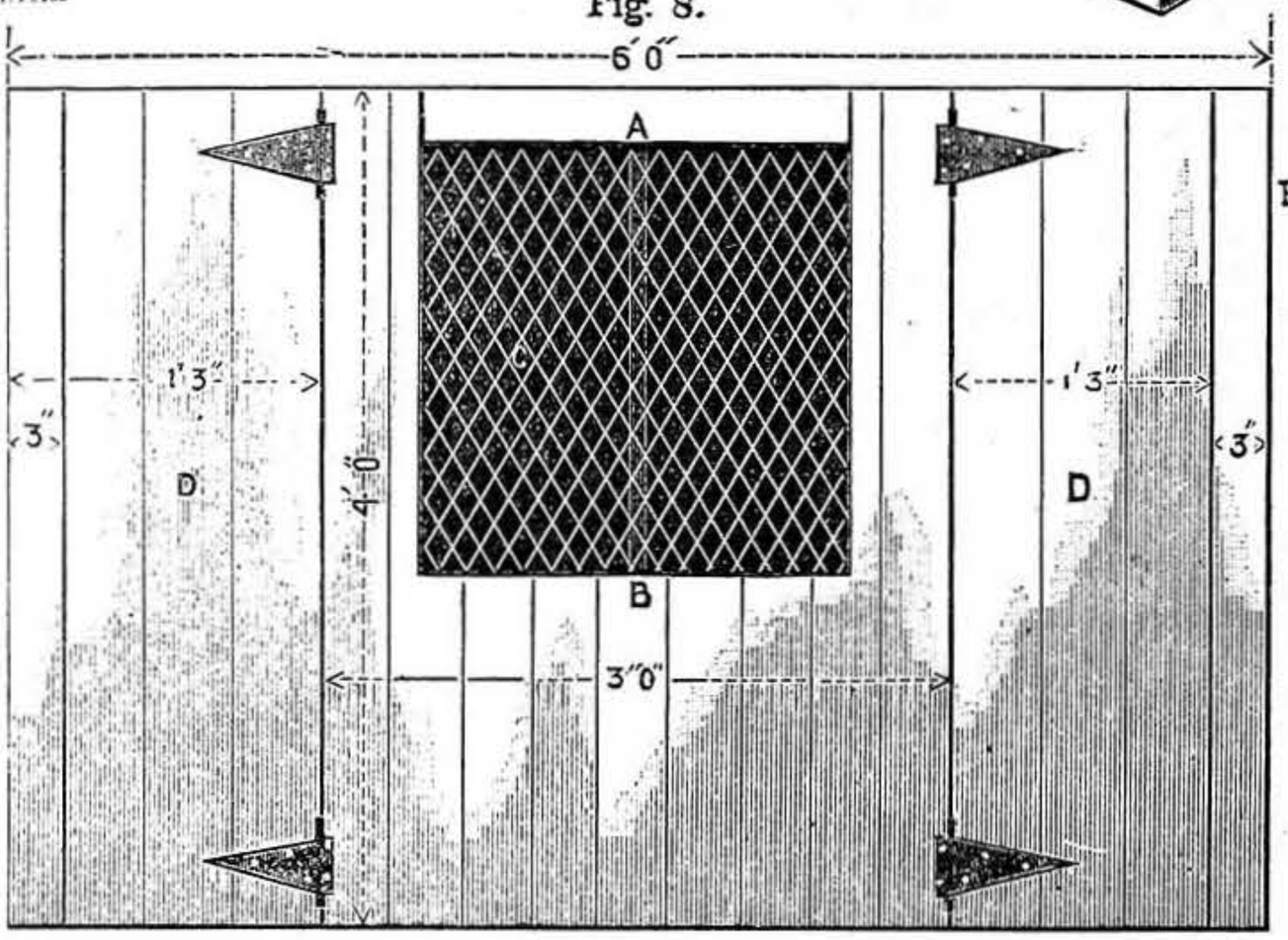


Fig 11

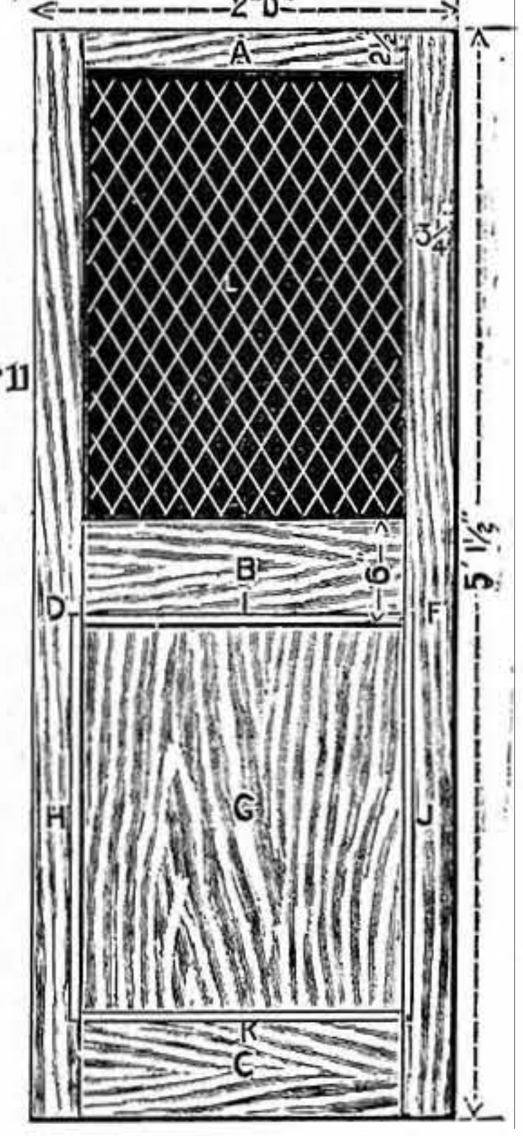


Fig. 6.—Section of Roof at Eaves—U, Upright; R, Rail; S B, Soffit Board; F, Fascia Board. Fig. 7.—Section of Roof at Ridge—R, Rafter; Ri, Ridge. Fig. 8.—Front View of Coops—A B, Division between Coops; C, Window of Wire Netting; D, D, Doors. Fig. 9.—Rebate on Top Rail of Run to receive Supports for Wire Netting for Roof. Fig. 10.—Ledge Door for Hen-House—A, B, C, Ledges; D, E, F, G, Match-boarding. Fig. 11.—Framed Door—A, B, C, Rails; D, F, Stiles; G, Panel; L, Wire Netting. Fig. 12.—Form of Nest.

* Mr. Scott's article on "Wire-work," on page 437, Vol. III., of WORK, should be carefully read.

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placed an inch or two into the ground. The netting is then fixed with small staples, and, if the fence is composed of two lengths of netting, one above the other, the edges must be connected with galvanised tying wire—*i.e.*, the top edge of the lower length must be connected with the lower edge of the top length.

Doors.—We now come to what will be to many the most difficult part of the construction—viz., the doors. The doors for the hen-house and coops are of the kind known as "ledge doors." Those leading into the grass plot and the run are "framed doors."

Ledge Doors.—As already stated, three of these are required: one for the hen-house, and one for each of the two coops. Fig. 10 is an illustration of the hen-house door. No description is needed, it would only waste valuable space. The doors for the coops are similarly constructed, but are 4 ft. long by 1¼ ft. broad.

Framed Doors.—The illustration (Fig. 11) shows the elevation of a framed door. Two doors are necessary, but both are the same size. They are for the entrances to the grass plot and the run, and are of this kind because they present a much more satisfactory appearance. Ledge doors would certainly look very out of place in the positions in which I have shown the framed doors in the illustrations; and framed doors would be equally out of place in the positions occupied by ledge doors. The doors consist of three rails, A, B, and C, of which B and C are wider than A; two long stiles, D and F, forming the sides of the door; a panel, G, which is inserted in grooves cut in the stiles and rails for its reception as shown in the Fig. by the dotted lines, H, I, J, K; and, lastly, a piece of wire netting, L, which is nailed on the inside of the stiles and rails. The dimensions of the door and its different parts are marked on the Fig., and it only remains to add that the stiles and rails are 1½ in. thick, and that the panels are made of sound, straight-grained ½ in. stuff. The rails and stiles are joined by mortise and tenon joints. The doors must now be hung and latches put on; those for the house and run doors should be similar to those shown in Fig. 1, while the other doors are fitted with 3 in. cabin hooks.

Window.—A small window is shown in Fig. 1: this is 21 in. long by 15 in. broad, and is made of two pieces, 21 in. long by 1½ in. broad by 1½ in. thick, and two pieces, 15 in. long by 2 in. broad by 1½ in. thick, mortised together. This frame is divided into four smaller frames by two cross-pieces, 15 in. by 1 in. by 1½ in., and 21 in. by 1 in. by 1½ in., joined at right angles to each other, and mortised and tenoned to the frame, as shown in the Fig. The window is then glazed with 15 oz. glass and hinged to the top horizontal rail with two 1½ in. butt hinges, so that the sash may be opened upwards and inwards. This concludes the outside work for the present, so we may proceed to fit up the inside.

Internal Fittings: *Nests.*—With regard to nests, they may be of any form, but are best on the ground. A long box may be employed, divided by partitions into separate compartments; or separate boxes may be used, which is preferable, as they are more easily cleaned. These separate boxes are illustrated in Fig. 12; they are open at the bottom, and also in front, with the exception of a strip, 3 in. high, to contain the straw. A piece of wire netting should be nailed over the bottom of the box to prevent rats from burrowing their way in; and the nests may then be placed in a row at the end of the house at which the window is placed, so that the fowls may be shaded from the light. The nests for the coops may be arranged any way, so that no one can see into them, with the one proviso that they be actually *upon the ground*. Chicks thus obtained always show more constitution than those hatched on a wooden bottom at a higher level. Let one of the boxes above described be placed in the back corner of the coop, touching the side, the front being turned to the back wall, and about 9 in. from it. The hen will be in the strictest privacy, and will be both perfectly sheltered and kept cool. Inside the nest put a layer of *damp* earth, or, in frosty weather, *ashes*. Make a hollow in the middle of this, and line the nest with straw cut into short lengths, and a few feathers in winter, sprinkling with a handful of flower of sulphur in summer.

Roosts.—Two perches will be required; these should be fixed not more than 18 in. from the ground, should be 1 ft. apart, and 4 in. in diameter. A rough pole with the bark on answers best; the claws cling to it nicely, and bark is much softer than planed wood.

Lining.—It is really necessary to line the interior with some sort of material. For this I recommend Willesden 1-ply paper, 56 in. wide, at 6d. per yard run for brown. Thus we get about 13¾ square feet for 6d., which is surely as cheap as anyone could desire for the excellent material obtained. The paper should be laid vertically, with an overlap at every joint of not less than 3 in., and be firmly tacked along the edge with galvanised tacks, 1 in. long. These joints must all come over the uprights.

Floors.—The floors of the houses and run should be covered with at least 3 in. of gravel, which should be renewed every year. This is essential, for in a short time the poultry will have cleared off all the *sharp small stones* which are so necessary for assisting them to digest their food.

Finishing: *Painting.*—The whole structure

LIST OF MATERIALS REQUIRED.

Pieces.	*Length.*	*Width in Inches.*	*Thickness in Inches.*	FOR	REMARKS.	*Approx. Price.* £ s. d.
11	8 ft.	4	2	Corner-posts of large house and run	To be placed 2 ft. in ground in position A (Fig. 2).	5 6
11	7 ft.	1½	1½	,, of grass plot	To be placed 2 ft. in ground in position B ,,	3 0
5	6 ft.	2½	2	,, of coops	To be placed 2 ft. in ground in positions C ,,	1 10
3	4 ft.	2½	2	,, ,,	To be placed 1½ ft. in ground in positions D ,,	9
4	5 ft.	3	1½	Horizontal rails of large house		1 0
4	8 ft. 4 in.	3	1½	,, ,, ,,	One must be cut to make room for door, the remaining part to be used for sill.	1 9
4	14 ft.	3	1½	,, ,, for run	One must be cut, as above.	3 0
2	8 ft. 4 in.	3	1½	,, ,, ,,		11
3	4 ft. 4 in.	2½	2	,, ,, for coops	To be fixed between tops of posts C, D; C, D; and C, D (Fig. 2).	9
3	4 ft.	2½	2	,, ,, ,,	To be fixed between the above, 1 foot up.	8
4	6 ft.	2½	2	,, ,, ,,	To be fixed, as directed, at front and back. Parts, cut to allow doors, to be used as sills.	1 6
5	4 ft. 2 in.	7	3	Rafters for hen-house	Two flat cuts to be made in each, which will give 3 rafters each 3×2¼.	5 3
2	4 ft. 8 in.	7	3	,, for coops	Ditto, ditto.	2 4
1	8 ft.	4½	2½	Ridge board		1 0
2	8 ft. 4 in.	4	1	Eaves boards for hen-house	Fixed, as in Fig. 1.	8
1	6 ft.	4	1	Eaves board for coops		3
	280 sq. ft.	6	⅛	Match-boarding for framework		1 0 0
6	9 ft. 2 in.	19	4-ply	Willesden paper for roof of hen-house	When ordering, get No. B.1.80.	13 9
4	5 ft. 6 in.	19	4-ply	,, ,, ,, of coops	Ditto.	5 6
3	12 ft.	9	¾	Boarding round foot of run	Shorter, owing to space for door.	3 0
3	14 ft.	9	¾	,, ,, ,,		3 6
3	8 ft. 4 in.	9	¾	,, ,, ,,		2 1
	129 ft.	24		Wire netting for run	2 in. mesh, galvanised (*see* WORK, Vol. III., p. 437).	18 0
	80 ft. run	1	¼	Lattice lath for covering ends of netting		8
1	8 ft. 4 in.	5	¾	Supports for wire netting at top of run	Two flat cuts to be made in it, which will give three pieces each 1½ in. by ¾ in.	9
3	20 ft.	4	¾	Boarding round foot of grass plot		5 0
	120 ft.	30		Wire netting for grass plot	2 in. mesh, galvanised.	1 1 0
3	2 ft.	6	¾	Ledges for hen-house door	See A, B, and C, Fig. 10.	6
6	1 ft. 3 in.	6	¾	,, for doors of coops		7
4	5 ft. 2 in.	3	1½	Stiles for framed doors	See D, F, Fig. 11.	1 1
2	2 ft.	2½	1½	Rails for ,, ,,	See A, Fig. 11.	3
4	2 ft.	6	1½	,, for ,, ,,	See B and C, Fig. 11.	11
2	1 ft. 10 in.	20	⅛	Panel for ,, ,,		4
4	9 in.	6½	15-oz.	Glass for hen-house window	Approximate size only.	6
	20 yds.	56	1-ply	Willesden 1-ply paper for lining	Order No. B.1.80.	10 0
						6 17 7

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should now receive three coats of paint. The houses, runs, etc., should be painted "stone" colour, and the roofs, "slate" colour. "Ah!" says some more than usually attentive reader, "you told us the Willesden paper was waterproof; and if that be so, why is it necessary to paint it, for paint is usually applied to articles to protect them from the ill-effects of moisture!" Yes, you are right; but does not Longfellow remind us to

"Trust no future, howe'er pleasant,
Let the dead past bury its dead!
Act—act in the living present!
Heart within and God o'erhead."

Therefore, let us "trust no future," but "make assurance doubly sure" by painting our roofs, even although made of "Willesden 4-ply paper."

Grass Plot.—The best time for sowing grass is in the spring, at the end of March. Dig the ground even, rake it perfectly level, and then sow with a mixture of grass and clover, at least 2 oz. of the mixture to the square yard, passing a roller over afterwards; or, what is the same thing, treading well, and afterwards beating with the back of a spade. When your grass becomes well established it should be frequently cut and rolled; cutting alone will not secure a good bottom without the compression which the roller tends to give.

Conclusion.—In conclusion, I may say that late autumn is the time for building your houses and runs. Secure good vigorous stock. Do not keep too many—twelve or fifteen are plenty for the house described. Do not feed wholly on corn or corn meal. Avoid damp soil. In winter look out for cold draughts of air, such as come from broken panes of glass. Remove the droppings from under the roosts at least three times per week. The hens must have a place to dust themselves, if you do not want to feed a lot of vermin. Dry sand, sifted ashes, with a little sulphur, will be excellent. There is one more essential for winter eggs—hens of suitable age. I prefer chicks hatched the last of April or beginning of May. After your chicks are hatched feed them liberally. But, you will say, is all this necessary? Yes, it is for the best results in this climate. And if you do not want to do the work, don't blame your hens because they don't lay. Answers to queries will be attended to in "Shop."

Thus the principal materials for our poultry-yard cost £6 17s. 7d. To this a few items must be added, such as gravel, nails, paint, etc., but these would not bring the cost up to more than £10. Then the labour item enters in and makes a big difference, for if a workman were employed to make a house, etc., according to the above plans, he would never think of charging less than £50. This amount the real student of WORK will save himself.

OUR GUIDE TO GOOD THINGS.

Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.

108.—An Electric Night Light.

The long, dark, winter nights are still with us, and early risers have yet to use an additional number of matches in consulting their watches during the small hours of the dark mornings. To such, the latest electrical novelty brought out by the Electric Stores Co., London, E.C., will be hailed by our readers as a great boon. This novelty consists of a mahogany box, nicely polished, and fitted with four cells of the E.S. dry battery connected to a 4-volt incandescent lamp fixed to the front of the box over a hook and velvet pad, on which is to be hung the watch of the owner. A flexible cable of insulated wire, terminating in a pear-shaped pressel, is coiled on a brass cleat on the side of the box. The box may be placed on the dressing-table, a watch hung against the velvet pad, the cable uncoiled, and the pear pressel placed under the pillow. When the owner of this novelty wishes to see the time, he has only to place his hand under his pillow and push in the stud of the pressel, when sufficient light is given by the lamp to see the time on the watch and light up the room enough to see all the objects in it distinctly. By fixing a small switch on the box and connecting this to the lamp, it may also be used to light the room whilst dressing or undressing. It is not advisable to use the lamp for more than ten minutes at a time, or the battery will soon run down; but with moderate use one battery should last during the winter months. As I have only had this novelty in use for a few weeks, I cannot vouch for its durability; but, as the material and workmanship are good, it ought to last for many years with an occasional renewal of battery cells. These are perfectly dry and safe to use; they give off no fumes nor offensive odours. The price of the set complete is 32s. 6d.

109.—Angel's Collar and Saddle Linings.

Though the horse is the best slave man has in the animal world, much of man's industry is devoted to waiting upon the horse, which shows that reciprocity exists to a large extent. For seat, the back; for draught, the shoulders of the animals have to be guarded from harm. How best done has occupied the thought, skill, and labour of humane man of all ages since the horse was subdued to saddle and harness. The main part of the horse to be guarded from injury is the shoulder, where the collar bears. Collars are made so variously now that the saddler must be a mechanical craftsman to be equal to making and repairing some of the collars horses wear in England and on the Continent. But, after all, the wear, like the wear of the sole of a boot, must be repaired from time to time, if the bearing is yielding stuffing or straw, flock, or other such matters. Dray and 'bus horses are subjected to great pressure on the skin of the shoulder and underlying muscles and blood-vessels. We cannot feel what the horse feels, but can imagine the persistent concussion of the collar on the shoulder of a horse that has three or four tons to haul at a trot often, must be painful if the bearing surface of the collar becomes hard and badly fitting; for after a certain point of fitness has been obtained by wear, then the collar becomes gradually ill-fitting, pressing on parts of the neck, throat, and withers, which should not be pressed upon severely, and the unyielding, compacted stuffing causes the collar to be as hard as a board. Galls and sores result sometimes; then, when the horse cannot earn money for his master, relieving the collar is thought of and done, and the horse is rested for the shoulders to get right again. This was noticed by Mr. Angel, a gentleman who has to do with a firm using many horses for heavy draught; and the frequency of the collars going to the saddlers' to be re-lined at 3s. 6d. each time, sometimes with unsatisfactory results, suggested to his inventive faculties that a simpler plan would be to have suitable linings ready made up and formed with a lacing-in arrangement to the "wale" and "face" of the collar. Being practical, he soon had the lining made of stout flannel, known as collar-serge, and two thicknesses sewn together, and a lace run in in loop-stitch form, round the edge. This lace is run through the metal eyes sewn on all round the collar-face and "wale," so that it can be laced in quickly and as quickly removed. This thin lining is stuffed with granulated cork, which has an agreeable yielding spring to the pressure of the horse's shoulders in drawing loads, and its well-known non-absorbent qualities prevent saturation by perspiration, so that sweating under the collar is lessened. As their prime cost is less than collar lining, and carters can take them out to dry and put them in easily again, it is obvious that there is economy as well as philo-animo feeling to recommend their adoption. They are patented, and have had about two years' successful trial with the leading brewers and carriers in London.

110.—Philips' Patent Revolving Orrery.

The Patent Revolving Orrery, which was invented and patented by Mr. J. G. Parvin, and is published by Messrs. George Philips & Son, has been sent us. It is a cleverly constructed and inexpensive appliance for finding the position of the various planets for every hour in the year, for indicating the position of a planet, the moon, or a fixed star, and for telling at what hour they will rise, south, and set. It will also indicate the phases of the moon, and show when eclipses will take place. It consists of two parts, which may be roughly described as two cards, one square and fixed, the other a movable circular disc. The square card is about 8¾ in. square and 12¼ in., or very nearly so, in diagonal measurement. The round card is 10¼ in. in diameter, and is placed concentrically on the square card and above it, being pinned thereto by a wooden knob with a spill that passes through both cards and is then fastened down, the circular card revolving on the spill as about an axis. The edge of the circular disc is marked with concentric circles nearly ⅛ in. wide. Of these, the first and outermost is divided into degrees, the second into hours, the third shows the signs of the zodiac, the fourth the seasons, the fifth the names of the months, and the sixth the divisions corresponding to the days of the months numbered consecutively, or, rather, in alternation, as the space at command does not admit of more than this. Above the circular disc is placed another card, also square, which is fastened to the square card below the disc at the four corners, the edge being cut in such a manner between the corners that the graduation and lettering on the bands at the edge of the disc are visible. The edge thus formed on the topmost card, which is covered with paper in imitation of grained leather, is divided into twenty-four spaces corresponding to the twenty-fours of day and night, and, moreover, shows relatively morning, noon, evening, and midnight at intervals of six hours. In the inner portion of the circular disc the zodiacal belt, comprising the twelve signs of the zodiac, is drawn. Within this broad belt the motions of all the planets are performed, and on it are shown the positions of the stars that form each sign. Screwed concentrically to the central knob or button already spoken of are two brass hands, one to represent the position of the sun, and the other that of any planet. These hands are slotted and graduated in degrees along the edge, and in the slot of each is a pointer. It should be said that the large oval opening in the uppermost square card, through which the zodiacal belt appears, represents the actual horizon. With this appliance, on the back of the square card, is given, first of all, an explanation of all the astronomical terms that apply to this instrument, and this is followed by full and clear directions for using the orrery. These, however, take up too much space to be inserted here, and they would not be clear and intelligible if they were given, seeing that it is highly desirable to have the instrument before you when attempting to follow them. For this reason I have confined myself to a description of the instrument itself, in the hope that this, coupled with the mention of the various results that may be arrived at by its aid, will induce many to get the appliance and try for themselves what they can do with it. It seems likely to be of use, not only for children in private families, but in schools also, and especially in those where apparatus of a more costly character, in the form of a celestial globe, cannot be afforded.

THE EDITOR.

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SHOP:

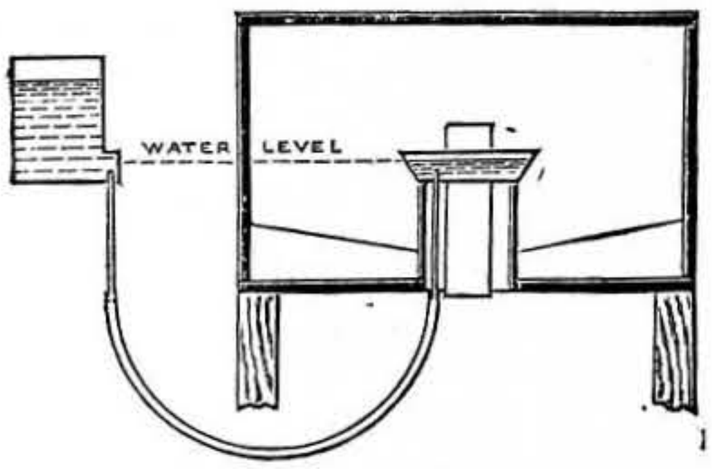
A Corner for Those who Want to Talk It.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Incubator.—LEGHORN writes:—"Since writing my Incubator article I have been experimenting with a view of providing some easier method of keeping the water in evaporating tray quite constant. Whilst visiting the late Dairy Show I was impressed with an idea which has since borne fruit. My improved plan consists of the adaptation of the principle of the ordinary poultry fountain, of which I subjoin a rough sketch, but which, I think, will



Evaporating Arrangement and Fountain.

make matters clear. The figure on the left is an air-tight zinc vessel, of rectangular form preferably, with a semi-circular piece cut out of the front at the bottom, and round this is soldered a semi-circular cup, into the bottom of which is soldered 2 or 3 inches of small brass tubing. This is to be connected with the 'overflow' pipe of evaporating tray with rubber tubing. The fountain part of the business will, I take for granted, be understood by all, so that by the laws of gravitation of liquids it will be seen that the height of water in the evaporating tray will be on a line with the water in the cup of the fountain, which should, I think, stand on a shelf away from the incubator, or might be hung by a nail to a wall, a lug being soldered on the back for the purpose. By raising or lowering the fountain we have therefore ready command over the water inside the machine, which can be increased or diminished as required, according to the state of the external atmosphere. The water container is easily filled from a jug without disconnecting, by tilting it, as in filling an ordinary poultry fountain. If made 6 in. high, 4 in. wide, and 3 in. thick, it will hold about a quart; if 2 in. by 4½ in. by 3½ in., about 3 pints; and if 8 in. by 5½ in. by 3½ in., about half a gallon. If not clear to anyone I will endeavour to give a more lucid description."

Incubator.—H. E., otherwise LEGHORN, writes:—"Replying to B. A. B. (p. 571, No. 140), I beg to apologise if I have been too impulsive in criticising his suggestion on p. 461, No. 133; at the same time I must repeat that his suggestion is utterly useless for the purpose recommended. WORK is nothing if not practical, and I deem it the duty of every reader to correct any representation he *knows* to be wrong. No, Mr. Editor, I have not tried B. A. B.'s plan, as it is quite needless to test foregone conclusions. It is freely conceded that 'mercury is used in several instruments' where its expansion is 'the feature of the invention'—the thermometer, for example; but surely B. A. B. does not contemplate regulating an incubator on this principle? If so, using a tube of proportional size to that figured on p. 461, he will require a bulb considerably larger than the incubator he is about to regulate. I certainly do not know what query evolved that reply; but the 'suggestion' is quite as remarkable as such as it would have been as an 'invention.' My remarks were not, and are not, written in a hostile spirit, but merely to save others from falling into the same pitfalls as I myself have done in past days when I had no beacon-light ahead. I note B. A. B.'s covert allusion to my criticism of Mr. Walker's incubator, but this was surely unnecessary, as neither he nor anyone else can, I think, justly find fault with that criticism. Before this is in print *my* article will probably be published, and if B. A. B. or any competent reader can improve on it, I hope they will do so, as much for my own benefit as for that of any other interested subscriber. Further, replying to L. G. W. (p. 573, No. 140), permit me to add that my regulator will suit Hearson's machine as well as any other, but as L. G. W. has one of their machines, he will find no difficulty in getting one of their patent regulators, if he can return the old one, but not, I believe, otherwise."

Tempering Axes.—J. C. K. (*London, N.W.*) writes:—"You must not quench the axe in salt and water as directed (see page 573, No. 140); it would spoil the eye, making it too brittle. It should not be 'low red,' but 'cherry red' heat. 'Then let down;' and to 'let down' should be explained, and how it is let down; here is the *main art* of tempering axes, or spoiling them by doing it wrongly. 'If you find the temper is soft,' etc., shows J. is only a poor describer of perhaps what he knows."—["My correspondent, J. C. K., says: 'You must not quench the axe in salt and water as directed; it would spoil the eye, making it too brittle.' Nevertheless, I repeat that salt and water is a very good and very common mixture, not only for axes, but for other tools. And besides salt, I might have named with equal truth such medicaments as saltpetre, sal-ammoniac, prussiate of potash, and other salts, all of which have a decidedly intensifying effect, and are therefore employed by many workmen who know full well how to do any job of tempering. My correspondent says, 'it' (the salt) 'would spoil the eye, making it too brittle.' Now, if J. C. K. knew much about the matter, he should be aware that the eye of a manufactured axe is not made of steel, but of iron, which cannot possibly be tempered, but that steel is only used for the cutting edge and for the poll. But supposing that the axe is made entirely of steel, as in a home-forged job, even then the eye is never tempered. It is not tempered any more than the shank of a cold chisel, or of a drill, or the tang of a file is tempered. It is the cutting edge only, and the steel for from half inch to an inch back from the edge that is let down and quenched, and so tempered. The veriest tyro knows something about these things, and I thought also that I had made these elementary matters clear in my paper on 'Hardening and Tempering,' on p. 546 of the present volume. Again, my correspondent says: 'It should not be "low red," but "cherry red" heat.' I ask, Why one more than the other? So long as the steel is not overheated, either will do, and if it makes no difference which, why say one is wrong and the other right, in a captious fashion? You shall take half-a-dozen smiths, and each one will quench at a different tint, and each, if asked, will name similar tints by different qualifying terms. Besides, a cherry red on a dull day will be a low red on a bright day, and how will you draw a line, unless you use degrees Fahr.? Further, if J. C. K. had done much work in steel, he would have learned ere now that almost every separate brand of steel requires to be worked at a different temperature, and also requires different manipulation, hammering, etc. Again, my correspondent complains that I do not explain how the tool is 'let down.' No, I did not; but I certainly thought that a correspondent who asks for information about tempering a particular tool has also the very elementary knowledge involved in the understanding of the term 'to let down.' Set information on elementary matters is given in articles, as in that of mine, for example, on p. 546; when questions are asked, the reply is confined rigidly to the scope of the question. Lastly, my critic finds fault because I say: 'If you find the temper is soft,' etc. Yes; and I repeat it most emphatically: if the temper is soft the tool must be re-tempered at a higher grade of heat. Unless you use a lead bath, which is done by wholesale manufacturers, and steel of a uniform grade, tempering tools is always a tentative operation, so that a tool may have to be re-tempered three or four times over, not merely where amateur work is concerned, but by skilled tool smiths. My correspondent ends: 'J. is only a poor describer of perhaps what he knows.' Well, I didn't ask J. C. K. for his opinion, and if I please the readers of WORK generally, that is all I care for. Still, it is well that he should know once for all that the staff of WORK is not composed of hack writers by profession, whose literary work is a mere digest of their *reading*. J. has earned his living as an engineer for thirty years past, and earns it thus still, and knows how to work, even if he is a 'poor describer' of what he knows. And he will always be glad to learn a thing or two from J. C. K., or any other correspondent, always provided the element of personal criticism is left out, for this is not suitable to WORK."—J.

II.—Questions Answered by Editor and Staff.

Piano.—A. P. M. (*Notting Hill*).—I would advise you to purchase the Index to Vol. I. of WORK, and also the numbers relating to piano making. You will see the address of an ironmonger, where you will be able to obtain an iron frame to suit your requirements. You will also find the address of action makers; if you write or call on these firms, you will be able to get prices.—T. E.

Piano Making and Hand-screws.—J. W. H. (*New Lenton*).—We are always willing to assist our readers, and pleased to know that you have received help from the pages of WORK. I should write to G. Buck, tool-maker, Tottenham Court Road; or Berry, Old Street, St. Luke's, London, for your hand-screws, or try Melhuish, Hobday, and others who advertise in WORK. For making wrest planks, iron cramps are generally used in factories, but if your woodwork is well planed and true there is no reason why hand-screws should not give all the pressure you require. I should advise you to order 18 in. screws for large work, such as ends, cheeks, tops and wrest plank, but a few 12 in. screws would be useful for general work. The price is usually one penny per inch, measuring the length of the drops, not the screws, so that 18 in. hand-screws would be 1s. 6d. each. You ought to get them in Nottingham.—T. E.

Fork Crown.—J. B. (*Dundee*).—The fork in the rough for narrow or broad tires can be bought of Brown Bros., Great Eastern Street, London; St. George's Cycle Co., Upper Street, Islington, London: Home Company, Bridgeton, Glasgow, and most cycle dealers. It does not require to be hardened after being brazed to steering tube.—A. S. P.

Electric Scarf Pin.—H. B. R. (*Leeds*).—Your friend was right. An electric scarf pin was described in "Shop," p. 520, Vol. II., in No. 84, and a battery for the same was described and illustrated at p. 792, Vol. II., or in No. 101. Both pins and batteries are now supplied by Messrs. Cathcart, Peto, & Radford, whose address has been given frequently in WORK.—G. E. B.

Whitening Piano Keys.—PIANO.—As you have scraped and polished your keys, and you say that yellow streaks still remain, it is probable that they are stained entirely through the ivory. You might try to bleach them by allowing a little spirits of turpentine to remain on them for a short time, keeping them exposed to the light. If this does not answer, I am afraid there is no other alternative than by having them replaced by ivory or celluloid, which would cost less than ivory.—T. E.

Dulling a Blackboard.—ART T.—If you will consult the indexes to Vols. I. and II. of WORK, you will find many references as to how to treat blackboards.

Aquafortis.—T. B. (*Sheffield*).—There is no method of making aquafortis less fluid and of a gummy consistence. By boiling, it would all boil away without getting thicker: but by freezing to −67° Fahr. it becomes a buttery mass. Of course it would have to be kept frozen; for, as the temperature rose, so would it become more and more liquid until it again reached its normal condition. Had you mentioned for what purpose you required it, I might have suggested some method of overcoming your difficulties. For instance, phosphoric acid is added to very fine sand until the sand will not absorb any more without becoming quite wet. In this state the acid can be conveyed, and is often sent abroad in barrels. For many purposes the presence of the sand is of no moment, and thus the acid is carried in a solid instead of liquid form; whereas, if the presence of the sand be objectionable, the acid can be washed out with water.—F. B. C.

Chemistry.—B. E. (*Plaistow*).—The best book on the manufacture of sulphuric acid is Dr. Lunge's "Manufacture of Sulphuric Acid and Alkali," Vol. I. "Sulphuric Acid," published by Gurney and Jackson, Paternoster Row, at £2 2s. A new edition has just come out, and contains 374 illustrations, drawn to scale. This is the standard work on the subject, and will contain all you wish to know. It might, however, be sufficient for your purpose to consult Dr. Ure's "Dictionary of Chemistry as applied to the Arts and Manufactures," which you could see at the London Guildhall Library. The best book of tests for metals and acids is Clowe's "Practical Chemistry," published by J. and A. Churchill at 7s. 6d. Thorpe and Muir's "Qualitative Chemical Analysis," published by Longmans, Green, & Co., at 3s. 6d., is also a good book, and has the advantage of being cheaper, although I prefer Clowe's.—F. B. C.

Mathematical Instruments.—G. B. H. (*Leeds*).—I bought a small set of instruments for a guinea in Holborn some six years ago, and they have proved very satisfactory. But there is no need to send to London, for any good mathematical instrument maker (and there must be several in Leeds) will sell you satisfactory instruments singly. These instruments depend principally upon the material of which they are made, and if you require good tools you must be prepared to pay for them. Do not get any that are all brass, those with steel points wear far better.—F. B. C.

Chromic Acid Battery.—AMATEUR ELECTRICIAN.—The glass jar form of chromic acid cell as shown in your sketch is constructed as follows:—Procure a glass jar similar to those in use by confectioners. Get a cover of mahogany turned to fit the jar, and collar of brass fixed to this cover, fitting the jar as shown in your sketch. Have the cover smooth and nicely polished. Now get three carbon plates, reaching from the cover to within ¾ in. of the bottom of the jar, and cast a lead head on each, enclosing a brass screw pin for connections. These pins will come up through the cover, and be secured by small brass nuts to a strip of brass connecting all three together. On one of these strips must be mounted a binding screw, to form the positive terminal of the cell. Next, get two zinc plates half the length of the carbon plates and ¼ in. in thickness. In one end of each drill and tap a socket for the screwed end of a ¾ in. brass rod two-thirds the length of the carbon plates, and screw these rods into the zincs. These rods should terminate in brass knobs, and must slide tightly in two pieces of brass tube soldered to two brass strips secured to the cover; the brass strips must be connected together, and fitted with a binding screw to form the negative terminal of the cell. It will be readily understood that the brass strips to which the carbons are connected must not touch those coming from the

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zinc plates. If the rods holding the zincs are made to slide stiffly in the brass tubes, the plates will be held up when drawn out of the solution, and a good conducting connection will be formed between the terminal and the plates. There should be an inch of space between the carbon plates; this will give nearly half an inch between the zinc and carbon surfaces. A chromic acid cell thus constructed will have a low internal resistance, and give a large volume of current through a circuit of low resistance. Its E.M.F. will be two volts—no higher than a smaller cell—and therefore will not be more powerful than a small cell in a circuit of high resistance, such as that of a small electro-motor. Two cells of pint size will suit your purpose better, as you only want to work the motor for a few minutes at a time.—G. E. B.

Induction Coil.—R. M. (*Chingford*).—Replying to your questions in the order put by you:—(1) If you put four layers of wire on the core for a primary instead of two layers, you will increase the resistance of the primary circuit and the inductive influence of the coils on each other, but you will also increase the magnetic reluctance of the core and the back current in the primary. The probable result will be a less efficiency in the coil, unless a good condenser is employed, and also a strong battery. (2) If you use No. 40 wire instead of No. 36, a thinner spark will be obtained from the secondary; and if the same weight of wire is employed in both cases, you should get a longer spark from, say, a pound of No. 40 than you would from a pound of No. 36. (3) The divisions made in induction coils are intended to divide the total electrical stress of the current in the secondary circuit. By splitting the secondary circuit into sections, and separating these from each other by insulating divisions, the danger of internal sparking is reduced to a minimum. All coils to give over a ¾ in. spark should be thus divided. (4) For a core 6 in. × ¾ in., use ¼ in. ebonite for the ends. Use two layers of No. 18 silk-covered wire for the primary. With 12 oz. No. 40, and a condenser of 60 sheets 4 in. × 4 in., you should get a ¾ in. spark when worked with current from three cells.—G. E. B.

Hot-Air Engine for Dynamo.—W. (*Bradford*).—As I have not had any practical experience with the Robinson hot-air engine mentioned on page 570, Vol. III., nor know any person who has worked one, I cannot pronounce on its merits as a motor. If it will do all that its inventor and its makers claim for it, there should be no difficulty experienced in its use as a motor for a small dynamo.—G. E. B.

Driving Cotton-Spinning Spindles by Electricity.—P. W. (*Stalybridge*).—There need be no difficulty whatever experienced in applying electricity as a motive power to the driving of cotton-spinning machinery. But if you already have sufficient power, and this has been applied to the machines, why desire a change? If you have to convert steam-power into electricity, and re-convert this into motive power for the spinning engines, the extra cost will be something considerable for plant alone, and you will only get 80 per cent. of the steam-engine's power in the spinning machinery. If, however, you wish to build a new mill in the vicinity of water-power, and wish to bring this power to your mill by other means than gearing, rods, or chains, then it might be advisable to have a powerful dynamo, driven by the water motor, and transmit the electric power to the mill through wire cables, where it can be used in driving electro-motors attached to the machinery. In any case, there need be no alteration of the spindles or machinery, the same wheels and the same bands being used, and any required speed can be obtained from an electro-motor.—G. E. B.

Oak Panels in Cabinet.—T. A. (*Little Bolton*).—I fear "Shop" space is too valuable at present to give a design suitable for utilising your oak panels. It might be too elaborate for the use of other readers. But perhaps you could convert the cabinet in No. 141, Vol. III., in such a way as to accommodate your panels; then you will find plenty of designs which are applicable for the carving—not in the style of the periods you mention, perhaps, but still very good. The sideboard in Vol. I. (see Index, price 1d.) might offer many attractions for you. Back numbers contain several designs which could be put to serviceable use.—J. S.

Writing-Desk. — AMATEUR (*Paddington*). — "The way to make a writing-desk . . . . about the average size," is rather a vague question. I presume you mean a small portable article; but I would like to know if I am right, or whether you need an office desk, or *what*. About the time you see this, drawings will probably appear in "Shop" relative to a small box desk with hinged flap—similar to an office article.—J. S.

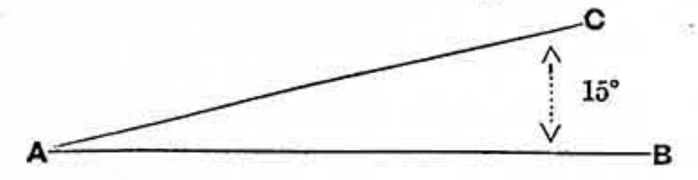
Model Electric Lights.—E. P. (*Waterloo Road, S.E.*).—(1) I congratulate you on your success in making electric lamps. The cement employed in connecting the carbon filament of the Bernstein lamp with its platinum wires is merely finely powdered coal-dust mixed with an ordinary cement. Some makers clip the ends of the carbon filaments in sockets made of flattened wire, and then electro-deposit copper on the joint to make it secure. I had no idea of anyone attempting to manufacture lamps from the instructions given in my articles on "Model Electric Lights," so did not give details of their manufacture therein. (2) Platinum wires must be employed to conduct the electric current through the glass stem of the lamp, because no other metal will expand in the same ratio as glass when both are heated. Platinised copper would expand more rapidly, and thus crack the glass. (3) The voltage of current from a dynamo may be increased by winding a finer wire on the armature, but such finer wire would not have the capacity of the larger wire, and in consequence, the volume of current in ampères would be reduced, or the insulation of the wire destroyed by internal heating of the machine. If there is room enough on the armature, the number of turns of wire and the voltage may be increased, but then there should be more wire on the fields to balance the wire added to the armature coils. Driving the machine at a higher speed will increase the output of current. If you wish for a greater output, choose a larger machine.—G. E. B.

Blacksmith's Forge.—S. S. (*Grantham*).—In my sketch of spark arrester I am assuming that the lower part of the chimney is brick; you say that the top is composed of a C.T. stove-pipe. To fit the arrangement on the top would be rather inconvenient, as you will see. I have shown in Fig. 1 a rough perspective sketch of the hearth and chimney of a blacksmith's forge; a part of the chimney I have shown broken away, in order to give a better idea of the position of the spark arrester, which is shown to a large scale in Fig. 2. Should your stove-pipe (4 in. diameter) start from the fireplace, you must yourself arrange from these sketches some contrivance to suit. Just below the spark arrester the chimney should be round in section, as shown at A; so if your chimney is now square—which most probably is the case if it is brick—you should have it made round, as shown in Fig. 2. Centrally above A must be hung a circular metal deflector, B, two and a half times larger than A, somewhat in the shape of an umbrella with the upper part pushed down, thus forming a hollow in the top and a corresponding projection inside, as shown (Fig. 2). This must be carried by a bolt, C, hung from the centre of a moderately fine-meshed wire gauge screen, D, considerably larger than the diameter of A: say, about three and a half times. This increase in diameter is so that the smoke will have sufficient area to pass through the gauze, as it will be considerably obstructed thereby. This screen should be built into the chimney, which should be enlarged as shown. E is a circular cast-iron water-trough running concentrically round A; there should be an overflow pipe for the water from it, or the trough, as it becomes filled with ashes, will overflow; an inlet for water is also necessary for replenishing after cleaning, the water being run off by means of a valve, F. G is a small door, through which the trough can be reached in order to clean it out. It is on account of this cleaning out that I should suggest it being placed as low down as possible. You, however, being on the spot, will be better able to judge the most suitable position for it. The smoke, sparks, and gases pass up through A, the steam being divided and deflected downwards by B, as clearly shown; the cinders being heavier than the gas, when once their course has been altered suddenly, will continue it, and fall into the trough of water and be extinguished, while the smoke proceeds upwards through the gauze, which will most probably arrest any few sparks that may have escaped the bath. If you settle on this arrangement, you must first decide where and what diameter A shall be, and all the other contrivances should be made proportional to it, and can be measured from the drawing when you settle the scale, which is the same as deciding the diameter of the chimney, A.—P. B. H.

Original Designs for Wall Papers and Calico-Printers' Patterns.—T. W. (*Accrington*). Advertise these in WORK. In the meanwhile, send a few samples, that I may see what you can do.—ED.

Coal Vase.—J. T. P. (*Bow*).—I must ask you to explain more fully your query. Do you mean the manner in which they are jointed together, board to board, or some mechanical contrivance? By pivoting, countersinking the pivots, and filling the holes up afterwards, the door or flap could be secured to open as usual without exhibiting the means upon the outside. Is it a collapsible article you allude to?—J. S.

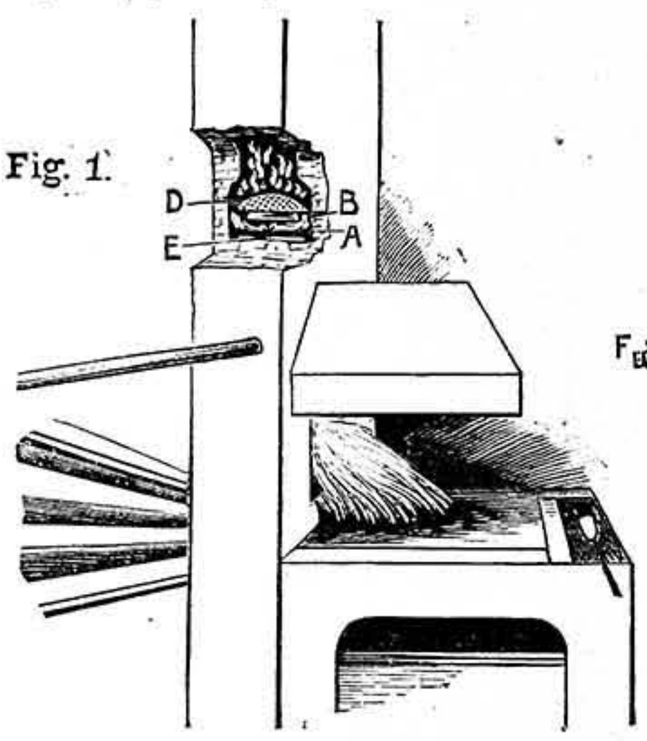
Spiral Cutters.—SPIRAL.—I am not much of an authority on spirally grooved cutters. I have not cut many, and those have only been for my own use and not for the trade. I usually make the angle of the spiral about 15° to the plane of the axis of the cutter—that is, if A B is the axis of the cutter, A C, which makes an angle of 15° with it, is the angle of the spiral groove. I have used this rate of spiral on various-



sized cutters with good success. Some makers seem to use a little less. I do not know whether SPIRAL'S set of change wheels is the full set supplied by the makers, but there seems to be sufficient to cut all the different spirals he is likely to require, at all events for cutter-making. Supposing it is required to cut a spiral of one turn in 6 in., that is 6 in. pitch. Now, since the screw in the slide has four turns to the inch of traverse, it must evidently make twenty-four turns while the mandrel makes one. The worm wheel on the spindle has forty teeth, single thread; the worm shaft must therefore make forty revolutions for twenty-four turns of the screw. The change wheels must therefore be in this proportion, 24:40, the larger wheel being on the screw. I think if SPIRAL follows out this reasoning, he will see how to get his wheels for any pitch. Of course, if two wheels will not do, he must compound exactly as in screw-cutting, keeping the proportions the same.—DAMON.

Galvanic Water. — READER OF WORK. — You have seen an electrical apparatus in which a basin of water containing a coin was placed, and persons not in the secret were challenged to take the coin out of the water. This they could not do, because the water was said to be galvanised. The basin of water was connected to one pole of a powerful induction coil, and the water thus formed a conductor of the electric current, just like the handle of an ordinary shocking coil. The water was not galvanised, nor is there such a thing as galvanic water. The experiment you saw performed may be repeated by you with one of the coils mentioned in my series of articles on "Induction Coils" now in the Editor's hands, in which such instruments are described and illustrated.—G. E. B.

Fig. 1.



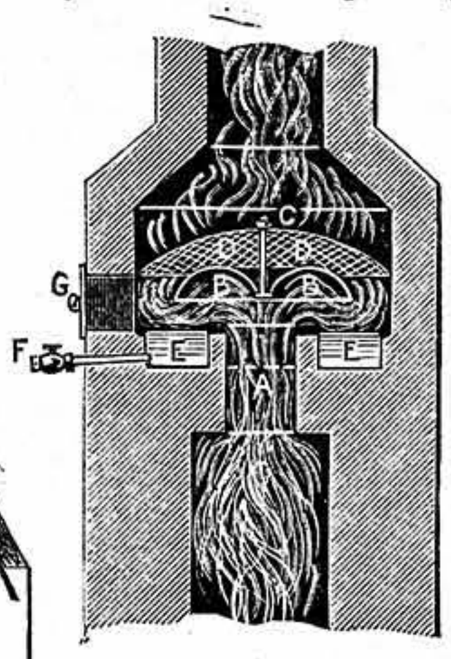


Fig. 2.

Blacksmith's Forge. Fig. 1.—Hearth and Chimney. Fig. 2.—Enlarged Section through Chimney, showing Spark Arrester.

Magnetic Saturation.—C. B. (*Regent's Park*).—The saturation limit of magnetism in best soft iron is 200 lbs. per square inch. It will take 5,000 ampères of electric current flowing through a suitable wire wound over soft iron to magnetically saturate one cubic inch of the iron. In malleable iron the saturation limit varies considerably with the hardness of the metal and its purity. In ordinary commercial iron the limit will rarely extend above 120 lbs. per square inch. In cast iron the saturation limit is lower still, so that a 5,000 ampère current will not magnetise a cubic inch of it beyond a power of holding 100 lbs. The variation in this limit will also be larger than in best soft iron; hence the frequent expressions of dissatisfaction with the results obtained from small dynamos.—G. E. B.

Power to Drive a Dynamo.—C. B. (*Regent's Park*).—Find out the total output for which the dynamo is built. If this is expressed in watts, divide the figures by 746, and the product will be the horse-power required to drive the dynamo. If the output is given as so many ampères at a pressure of so many volts, multiply the volts by the ampères, and divide the product by 746 as before. As a dynamo works best when more than enough power is provided, it is safe to allow 10 per cent. for loss in friction and slipping of belts, but this should be increased when small machines having small driving pulleys are to be driven at a high rate of speed. Much also depends upon the width, tightness, and length of the belt. A tight, narrow, and short belt will absorb more power in overcoming friction than a wide and long belt moderately tight. It is not usual to run all the current through a voltmeter and ammeter on a lamp circuit, so as to always read the state of the current on these instruments. They are usually mounted on the switch-board as shown at Fig. 92, p. 837, Vol. II. of WORK, and connections are made with them as required by means of switches, the connections being shown in diagram Fig. 94 on the same page.—G. E. B.

Zincography. — LIONEL. — There is such an affinity between zincography and lithography that almost everything that has been already said in the different papers running through the third volume of WORK on "Artistic Lithography," applies equally well to the above branch of the art, the great difference being, as the name implies, that one is

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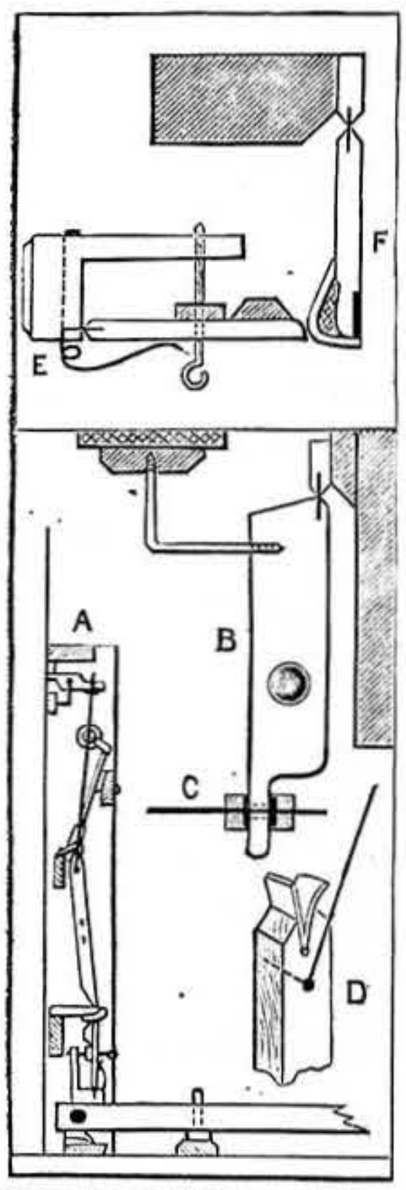
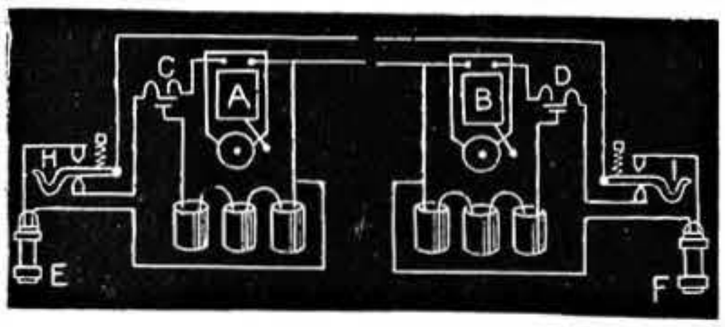
drawn on and printed from a litho-stone, and the other from zinc plates, so I can only ask you to refer to the back numbers for an idea of *drawing* on zinc or stone. To give an outline of *printing* from zinc or stone would take up a great deal too much space in "Shop," as a whole volume might be written on the subject, and to write a brief sketch would only give you, or any other reader, an imperfect knowledge of what is required. One principal thing to be noticed is, that drawing an outline on stone in lead pencil, and working over this a tint, it may or may not print with a white line or space, wherever the pencil has touched the stone; but on zinc the pencil line would print as a solid black line, therefore I must warn the artist to be most careful to put the drawing on the zinc by means of the red chalk transfer paper mentioned on p. 115, No. 112, Vol. III. of WORK. Another thing is that zinc not possessing quite the same qualites as stone, the ink, or chalk, etc., does not penetrate it to quite the same extent, so the artist has to be much more careful in etching the drawing in case of accidents to the work. Damp weather has a great effect on the zinc plates, although in a rather different way to stone, therefore the necessity of keeping the plates as dry as possible. A preparation of nut-galls must be used instead of nitric acid in etching the plates.—A. J. A.



Pianoforte Action—A, Section; B, Damper; C, Damper Wire; D, Sticker; E, Hopper; F, Lever.

Pianoforte Action.—W. D. (*No Address*).—The action you have in your piano is known in the trade as the "sticker" action, and I should think it is powerful enough for your piano, as it is probably strung light, or with thinner wire than is used now. Of course, your piano would be much improved if you added dampers and re-hinged the stickers with new leather, also covered the levers with leather in the same manner in which they are covered. I have sent a sketch with letter, which will make plain to you how to attach dampers. I would not attempt to make them if I were you, as you can purchase for 4s. 6d. a set of 60, and if the hinges of the levers are worn out, get a set of new ones made to pattern 1, which will cost you 3s. a set. The dampers are hung with glue on a rail which extends from one upright of action to the other. If you will look at No. 46, Vol. I. of WORK, you will see how to fix damper-rail, and you could fix a soft pedal as described there. Materials you can purchase from Mr. Hallpike, of Mare Street, Hackney, E., who will send you them by parcels post. If you order the dampers, send a rough sketch from mine, and he will understand what kind you require; and ask for damper wires complete. You will see that the damper wire goes through the side of the sticker, then through a hole in the damper, and is fitted with buttons and cloth washers to pull it down. If you think you cannot manage to repair the action, I should send it to the above address, and ask Mr. Hallpike to repair it and add dampers to it. I don't know that I can say any more at present. If you are in difficulty, write again.—T. E.

Bell and Telephone Line.—A. B. G. (*Ascot*).—To ring two bells and work two ordinary bell telephones over one line of wire you must employ



Bell and Telephone Line. Diagram showing how to arrange two Bells and a pair of Bell Magnetic Telephones to work over one Line—A, B, Bells; C, D, Three-way Keys or Pressels; E, F, Bell Telephones; H, I, Automatic Hook Switches.

two batteries, and connect them as shown in the annexed diagram. To do this, you must employ a three-way key, or pressel, and an automatic hook switch for the telephone at each end of the line. In the three-way key, a brass spring, shaped as shown in the diagram, engages with a hooked spring when at rest, and thus forms a bridge for the current. When the long spring is pressed down on the T contact beneath it, the current is diverted in another direction. The automatic hook switch is also constructed on the same principle, and its form is shown in the diagram. When the telephone is hung on the hook of this switch it is pressed down on the lower contact stud, and connects this stud with the pivot on which the lever of the hook works. When the telephone is off the hook, this lever is drawn by a spiral spring against the upper contact stud, and cuts the bell and battery out of circuit at the same time as it provides a closed circuit for the telephones. When both telephones are hung on the hooks at each end of the line, both bells are placed ready to be thrown into circuit with the batteries on bringing either of the long springs of the key with the T contact pieces. If you wish to ring bell A, the telephones must be hung on the hooks, and the key, D, pressed down; the current will then pass from the battery under B to the spring, D, from this to the under contact of the hook, I, then by the line wire to the hook, H, and by its lower contact across the bridge, C, through the bell, A, and back to the battery by the other line. When the bell, B, is to be rung, the bridge, C, is depressed, and the battery under A is thrown into circuit with the opposite bell. The length of the circuit—that is, the distance of the two bells apart—will make no difference at all to the arrangement of the instruments. If the telephones are to be hung in rooms at some distance from the bells—as in your case, where the bell is in the passage—then have the keys near the telephones, and thus control the circuit. These are little matters of detail which can be worked out by the aid of the diagram.—G. E. B.

III.—QUESTIONS SUBMITTED TO READERS.

*** The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Shoe-Mending.—DUMMY writes:—"Would any reader kindly inform through 'Shop' the simplest way to fix bristles into wax-ends, with a sketch?"

Engraving on Brass and Metal.—NELSON writes:—"Can any reader of WORK kindly tell me what course I had better take? I wish to learn the engraving for work on coffin-plates, brass and metal. Where could I get instructions and tools for the same? I am a fair writer."

Fan-Power for Lathe.—WORKITE writes:—"Will some reader please give me the sizes of a circular fan (on the Canadian principle) which would have sufficient power to drive a 6 in. screw-cutting lathe, and also instructions and dimensions to make same?"

Tailors' Cutting and Fitting.—G. R. D. (*Cheetham*) writes:—"Will any reader inform me whether there is a work to be had on tailors' cutting and fitting, where to get it, or any information on the subject, as I wish to learn it?"

Model Ship-Building, Rig, etc.—CUTTER writes:—"Will anyone advise me as follows: 26 in. racing yacht, 6 in. beam, 7 in. depth, 8 lb. lead keel, length of spars, how to rig, size of sails, etc.?"

Paste and Varnish.—C. R. (*Birmingham*) writes:—"Can anyone give me a recipe for making paste as used by best leather-workers; also the varnish used for delicate-coloured leather goods, and how used? What preparation, if any, is first put on? Also I should be glad of the address of the makers of a patent paste. There is a Company somewhere in London, but I forget the address."

Market for Fretwork.—FRETWORKER writes:—"Will anyone kindly tell me if I can sell brackets, etc., when made up, and where?"

Lucifer-Match Making.—ANXIOUS ENQUIRER writes:—"Will any kind reader of your valuable paper tell me the various compositions, and how to mix them, so as to enable me to make the common lucifer-match?"

Paste Diamonds.—J. H. (*Bury*) writes:—"Will any jeweller reader of WORK kindly give me any information as to how paste diamonds are made?"

Upholstery.—SILLY S. writes:—"Will anyone kindly inform me through the medium of 'Shop' the addresses of the best houses to obtain upholstering materials and requisites from?"

Crib and Dresser.—JOINER writes:—"Could any reader give me a good design, with all particulars, for a baby's crib (wood); also for a kitchen dresser, the latter to be about 8 ft. in length, or inform me where I could find good designs?"—[JOINER should purchase the indexes to Vols. I. and II., wherein much upon these matters appears.—ED.]

Maguay Lamp.—ELECTRIC LAMP writes:—"Will anyone kindly inform me through 'Shop' where I can purchase Maguay's electric lamps?"

Gas Engine.—LATHE writes:—"I am contemplating the purchase of a gas engine. Will any brother reader inform me as to the most effective, with the least floor space?"

Marble Table-Top Stand.—W. R. (*New Cross*) writes:—"I have an inlaid marble table top, and would thank any reader to kindly give me a design for a stand to it. The size is 2 ft. 8 in. by 1 ft. 6 in. I thought of having it in oak or some other hard wood."

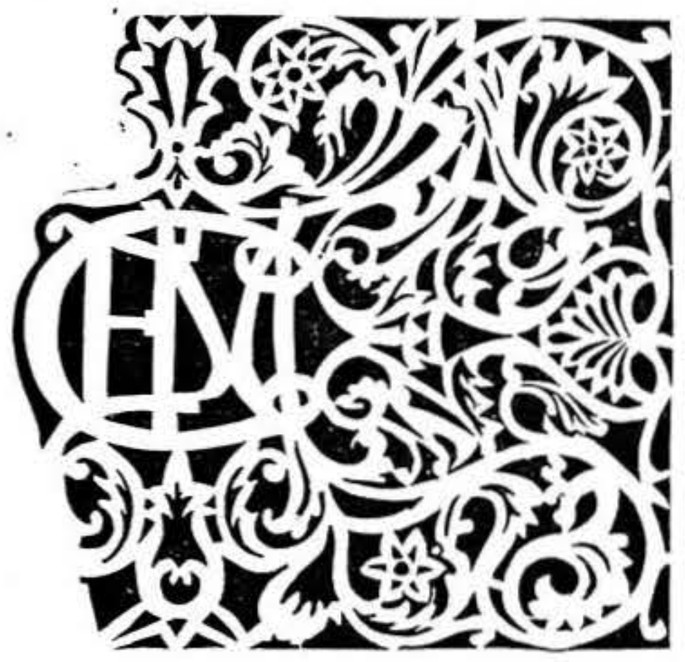
Bamboo Flower Stands.—MELTON CONSTABLE writes:—"Can any of your readers inform me as to the cheapest place where I can obtain bamboo cane for making flower-stands, etc., and can anyone suggest an easy method for making the same?"

Naval Architecture.—ART T. writes:—"Will any reader name a good, moderately priced book or books on naval architecture as applied to the present time? I have a book by Peake, but it seems too old-fashioned in its matter (timber ships only) and in its manner of stating things and drawings. Are no rules for finding capacity, and other matters, asked for by the Science and Art Department at the annual examination?"

Fishing-Rods.—W. J. T. R. writes:—"I shall be much obliged if any reader will tell me (1) what description of cane is used in the manufacture of split-cane-built fishing-rods; (2) where it can be got; and (3) probable price."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Monograms.—F. J. (*Exeter*) writes:—"In reply to some of your correspondents requiring monograms, I send two, hoping they may suit. The first is for MUGGINS (see WORK, p. 606, No. 142). One of the best methods he can employ to put the monogram E. M. C. on a box is to cut out a design in



E. M. C. Monogram for Box Cover.

fretwork, the same size as the top of the box, with the monogram in the centre, and glue it on with a small bead round the edge. Unfortunately, he does not give the size of the box, but this design is suitable for enlarging three or four times. He will see that the initials stand out boldly against the adjoining fretwork, as the latter is of a smaller pattern, which makes the monogram very distinct. I have shown one-half only of the design, but the other part is similar: only reversed, of course. The initials E. H. S. are for G. S. (*Gateshead-on-Tyne*) (see WORK, p. 606, No. 142), for illumination. If the letters are intended to be gilt, where they overlap they must have a dark tint to separate them and throw up the top letter. Shading may be put in similarly, the light being supposed to come from the left upper corner. The ground could suitably be a light blue, with faint white or gold curved lines on it. In these designs I have endeavoured to make the monograms as plain and clear as possible, the ornament being treated as a harmonious accessory, so that one's time is not wasted in trying to decipher them, as in many cases where letters and needless curves are run into each other, and make it extremely doubtful what letter comes first. They ought to be called 'puzzle monograms.'"

E. H. S. Monogram for Illuminating.

Chuck.—M. (*Bishop Auckland*) writes, in reply to YOUNG TURNER (see p. 590, No. 141):—"If you refer to p. 28, No. 54, of WORK, you will find drawing and description of chuck, which you may make in wood. If there is any part not clear, if you write again I shall be glad to help you."

Gum.—W. L. F. (*Dublin*) writes, in reply to GUM (see p. 622, No. 143):—"A good gum for ordinary purposes can be made by dissolving gum-arabic in sufficient warm water to bring it to the consistency required, and when cool, a few drops of oil of cloves or alcohol will preserve a quart from turning sour."

Horse-Collar Hames.—F. H. (*Battersea*) writes, in answer to L. M. (see p. 637, No. 144):—"Horse-collar hames are not lacquered, but covered with thin brass, fixed on the rim with a soldering-iron. Any harness-maker will get them re-covered for you. If you had sent your address, I might have told you of a firm near."

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Re-transfer Ink.—A. J. A. (*London, W.*) writes, in reply to LITHO (see p. 558, No. 139):—"I do not know of any printer who would spend the time in making his own re-transfer ink from plate to stone, as it is one of the things much better bought ready for use; but should you require to make your own ink, then take equal proportions of tallow, wax, soap, shellac, pitch, and litho printing ink, and set on fire the first three, and burn for a quarter of an hour; melt the rest, and mix. Should the ink be still very soft, keep it on the fire at a great heat (without burning) until it is sufficiently hard; the different things should be melted in the above order. If you use varnish and lamp-black instead of the printing ink, then the proportions should be varied to correspond, using more shellac and pitch, as in the first receipt the printing ink already contains these in greater proportions."

Transfer Drawings.—A. J. A. (*London, W.*) writes, in reply to DRAUGHTSMAN (see p. 590, No. 141):—"To make a transfer drawing for zincography proceed in exactly the same manner as if it were to be used for stone. You should not use a transfer ink for drawing with, as that is only for the use of the printer. The best litho ink is either 'Lemercier's' or 'Vanymbert's,' both in sticks, which rub on a saucer and mix in the same way as I have already mentioned on p. 66, No. 109, Vol. III. of WORK. It should be of just sufficient consistency to stick to the saucer and not glide off from it. It is not advisable for you to use crow-quill pens; there are special pens prepared for lithography, the best of which are Tillott 290, Somerville, and Mitchell, and if you use either of these pens with the above ink I think you will find your difficulties vanish."

Glue.—EDDIFRA writes, in answer to CONSTANT READER (see p. 606, No. 142):—"The best way of preparing glue, and which is used in large cabinet-makers' shops where a quantity of veneering is done, is to get a fruit pan of six quarts, or an iron boiler that is used for boiling clothes, and nearly fill with broken glue; cover with water, and allow to stand twenty-four hours; then place on hot stove, and let a boy stir it and look after it for eight hours (often have I stirred glue that length of time). When cold, there will be no way of cutting it out except by warming chisel or plane irons in hot water previously; then it is placed in ordinary glue-pot, and water added."

Wool-Working Machinery.—MESSRS. T. G. AND SON (*Sheffield*) write, in reply to D. G. (*Oldham*):—"We beg to state that the largest makers in the world of these machines we believe to be The Arbey Wood-Wool-Making Machine Company, of Paris, for whom Messrs. T. & W. Cole, London, E., are, or have been until quite recently, the English agents; but we now believe that the firm (Arbey Company) have now ceased to push the trade in England. The North of England Wood-Wool-Making Company, of Leeds, supply a good article, and this firm or Messrs. Cole can give your friend every particular. We ourselves make the knives for these machines."

Preserving Stone.—E. H. S. (*Corfe*) writes, in reply to H. L. P. (*Montrose*) (see p. 526, No. 137):—"You ask for a preservative for the stone of a church spire. I may state that a dressing with a liquid called 'Fluate,' obtainable from the Bath Stone Firms, Limited, Bath, has proved successful in arresting decay in stone both in France and England."

Fire Extincteur.—THE ASSISTANT ENGINEER, Hackney Union (*Homerton, E.*), writes, in reply to W. L. (*Dalston*) (see p. 606, No. 142):—"I shall be pleased to show or tell W. L. how to charge the same."

Saw Hammering.—A. R. (*Scorrier*) writes, in reply to J. S. (*Keighley*) (see p. 606, No. 142):—"The face of the anvil should be a little convex for saw hammering. The best method for saw gulleting is to gullet with the emery-wheel. The fly-press tends to cripple the plate, and merely punches out a piece of steel, leaving the teeth to be sharpened to the bevel required after, while the emery-wheel gives the teeth their proper rake and bevel at the same time the gullet is being ground."

Continuous Alarum Clock.—M. W. (*Manchester*) writes, in reply to A. S. (*Lavender Hill*) (see p. 654, No. 145):—"A Mr. Cook, of Shakespeare Street, Manchester, is agent for a new electric alarum clock, which acts for forty-five minutes. I should think this is sufficient. It is quite a new thing, and the clock is removable, and can be used separate from the pedestal, which also constitutes the battery or cell. I believe the price is about 16s."

Alarm Clock.—F. C. (*Slaithwaite*) writes:—"In No. 145 of WORK, A. S. (*Lavender Hill*) wants to know where he can obtain a continuous alarum clock. I beg to state that Mr. Bassindale, of this place, receives orders for same."

Tailoring.—TAILOR writes:—"If APPRENTICE (see p. 654, No. 145) will write to the *Tailor and Cutter* office, 93 and 94, Drury Lane, London, W.C., for their chart and catalogue, he will find the books he requires for all tailor-made garments."

Upholstery.—A COUNTRY CABINET MAKER writes, in reply to W. W. (*Notting Hill*) (see p. 590, No. 141):—"I have just seen your query in WORK, and will try if I can help you. I do not know whether your difficulty arises from want of knowledge or want of experience, but you will excuse me if I treat it as being want of knowledge, as I think I can make my explanation clearer by that means. You also omit to say whether your roll is hair, fibre, or alva, and whether the stuffing is single, with roll stretched on (London cheap style), or the old 'first and second stuffed'; but if I describe the latter thoroughly, and you thoroughly master it, you can always modify. I shall therefore take that style with fibre and flock. I will assume that you have got on your web and canvas, or web, springs, and canvas, as the case may be. Now start a row of loops of twine round the edge for the fibre; start from back corner and give about two loops on the sides, and three in front, pointing the needle backwards, so that the second loop begins two or three inches *behind* the end of the first, and so on all round. Of course, you will understand that in all stringing it is only made fast at the beginning and the end, so that each loop can draw upon the others. Now, having your fibre nicely picked, tuck it under the strings evenly, and when you think you have got enough in, go round and regulate it with your fingers till it is nice and even all round; upon this depends the regularity of the work when finished. Then fill in the middle with flock, and put your open canvas (scrim) over, being very careful to get it on straight, for crooked threads are often a cause of hills and holes; then tack it down with temporary tacks to about shape of seat, and then stitch through with a row of twine about 4 in. from the edge all round, to keep all in place. If time will allow, it will be well to go round again, and tack it down more nearly to the shape; but this is not imperative. Then start in middle of front, cut away all waste canvas and turn in with regulator, and put in two or three tacks, about 1 in. or 1½ in. apart; this must decide the height of the pad. Then work each way from these, and keep testing the height by pressing it upright between thumb and finger at the middle and at the point you have reached at the same time, and comparing them; these tacks are not driven home. Then go round it with regulator, and equalise any little irregularities. Next give a row of tack stitching; start at back corner, and fasten twine round first tack, then pass the needle up, but not quite out, and bring the eye point down on the right-hand side of the next tack or next but one; draw twine down, and pass needle up on left hand of same tack, and so on all round; then drive tacks home. Then give one row caught stitch, passing needle up, out at top, and in again about 2 in. back, knotting the first stitch; then, taking about 2 in. each time, bring the needle down just in front of the previous stitch, and loop the twine round it below: this will make a nice even roll if you keep it an equal distance from the edge. Then go round again in the same way a little distance from the edge, and this will make up a little roll about as thick as the finger, or less, and if you have used the regulator well there ought to be no lumps or hills and holes in at all, but a nice even edge all round. This description may seem long and tedious, but I think if you follow it out carefully on one or two seats, you will find that they will come out about what you want, and you can then put less work in if you require to do so; but you will find a little extra painstaking at first will pay in the end. Any further hints I shall be glad to give as far as I can."

Darning Weaver.—RALPHO writes, in reply to MART (see p. 621, No. 143):—"You can get the darning weaver from Edwards & Barnes, Broad Street, Birmingham. I do not know the price, but it is quite trifling."

Mangle Rollers.—EDDIFRA writes, in answer to LEARNER (see p. 654, No. 145):—"The plan I follow in turning rollers, beech and lignum vitæ, is to procure the rough sawn roller, and bore a hole in each end, by means of an auger, small enough to allow the shafts to be driven in a permanent fixture; the hole in the beech roller may be smaller than the lignum vitæ, as the latter is terrible stuff for splitting. Drive in shaft as true as possible, run in dead-centre lathe, and drive by means of a carrier fixed to shaft. Run lathe as fast as you can without undue shake, and trim down roller with a ⅝ in. or ¾ in. turning gouge; finish off with a 2 in. chisel or a jack-plane iron fixed in wood handle. The ends may be turned true with a lathe cutting chisel—or the safest is a round-nose—and finished with a diamond point, as there is not so much danger of slipping against the iron shaft."

Steel Springs.—W. P. writes, in answer to WING (see p. 686, No. 147):—"If he will write to me, William Park, 8, Cobden Street, City Road, Hulme, Manchester, sending rough drawing and all particulars, and gauge of thickness, I will send him prices."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—R. W. (*Fence Houses*); R. D. B. (*Finsbury*); J. T. G. (*Glasgow*); E. A. F. (*South Woodford*); W. B. (*Rushden*); ACTUAL; A. C. (*Manchester*); E. P. B. (*Penge, S.E.*); A. W. A. (*Durham*); R. McG. (*Glasgow*); F. B. (*Clapham, S.W.*); PORTLAND; T. G. (*Paddington, W.*); H. McD. (*Glasgow*); A. D. (*Sheffield*); W. S. (*Carr Bridge*); A. S. (*Hockley*); W. S. (*Gosport*); W. P. (*Hulme*); MAGNET; F. J. T. (*Beckenham*); G. N. (*Manchester*); DICK II.; FENTON; STILL; J. W. (*Kirkham*); INCUBATOR; RESIN; BANNER; J. G. (*Holloway*); INTENDING CARPENTER; R. H. (*Lancaster*); E. W. L. (*Newcastle-on-Tyne*); J. C. J. (*Gloucester*); C. E. M. (*Birkenhead*); IVY; W. S. B. (*Barking*); W. C. (*London, W.*); YOUNG TURNER; J. P. B. (*Birmingham*); W. G. (*Leeds*); F. C. F. (*King's Cross*); G. E. B. (*Stoke*); SCIENTIFIC; DROFSABA; G. N. S. (*Biggleswade*); G. P. (*Elgin*); L. J. K. (*Dublin*); YOUNG READER; CONSTANT READER; J. A. (*Wandsworth*); G. L. (*Sheffield*); H. W. (*Byfield*); A. D. (*Blackburn*); J. W. C. (*Sussex*); BONA FIDE; AURIPHONE; A SUBSCRIBER; POOR MAN; F. C. (*Leytonstone*); P. L. (*Selly Oak*); S. S. (*Grantham*); M. D. (*Blackburn*); R. S. (*Chorley*); YOUNG CABINET-MAKER; W. J. M. (*West Kensington*).

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Fretwork Designs.—Six magnificent Animal Brackets, 1s. 1d.; six large Comic Designs, 1s. 1d. Complete Outfits, 1s. 3d., including wood and design. Post free.—TAYLOR'S Fretworkeries, Blackpool. [15 R

Lathe.—Britannia Co.'s No. 8, 3½ centres, ⅝ nose, Whitworth 4-speed pulley and gut, 2 ft. 6 in. bed, driver, and universal chuck. Weight, 180 lbs. Hardly used. Cost £7 15s. Cash, £5 10s. Receipt shown. Any evening after seven.—4, Albert Road, St. John's, London, S.E. [2 S

For Sale.—4-pint bichromate Battery, in box, with lifting arrangement. Cells can be used separately. Complete, 7s. 6d.—JOHNSTON, Clothier, Lhanbryde, N.B. [3 S

Horizontal Engine, Castings, ½ horse power, planed, bored, faced, brass bearings; cost 50s. Exchange Detective Camera, or cash offer.—Particulars, E. BLAKEY, Bridlesmith Gate, Nottingham. [4 S

Moor's Simplex Chromic Acid Battery.—Send stamp for circular to MOOR, 23, Hill's Road, Cambridge. [16 R

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